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73 Amateur Radio Today

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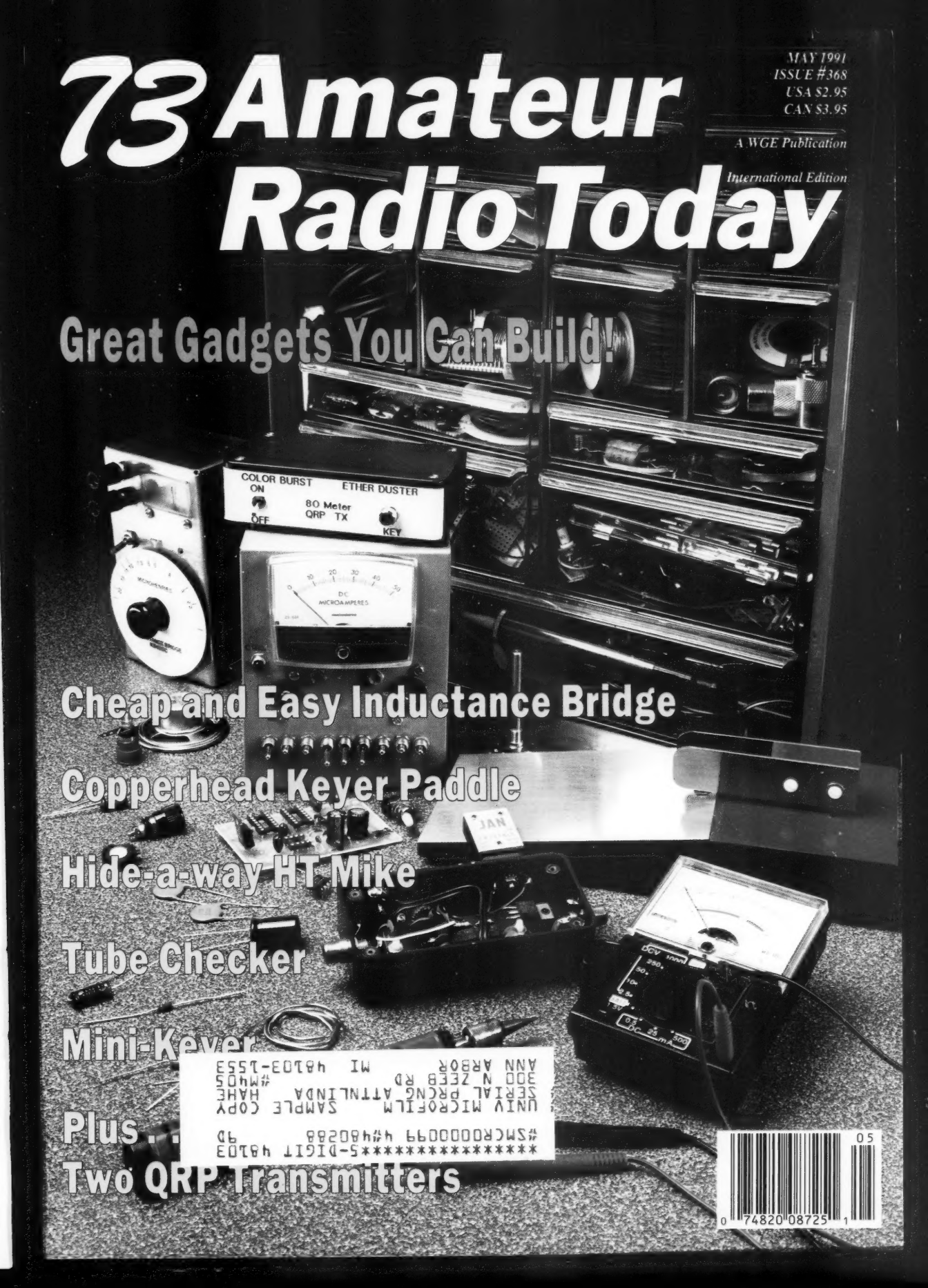

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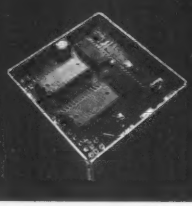

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LETTERS

From the Hamshack

Joseph W. Bento N6DGY, N. Chicago IL Do things never change? Or should I put it, does the ARRL never learn from mistakes? I recently picked up a 20-year *73* collection (1960–80) and have been enjoying your old editorials. Old doom and gloom Wayne actually knows what he is talking about. The vast majority of your predictions from the '60s are a reality today. You said 220, use it or lose it in the '60s. The ARRL's incentive licensing scandal. Thought I'd let you know how right you've been all these years.

It is fun to read those old editorials. On the doom parts I wish I'd been wrong . . . . Wayne

Marv KB9KYV Several months ago, after receiving my Novice license, I subscribed to *73*. I find it to be quite interesting and informative, especially your editorials on the state of the ARRL and the ham bands, electric blanket nightmares, the electromagnetic/cancer connection, microwaved brain cells, ad infinitum. I'm feel that I'm getting a perspective on ham radio that I would not get in another publication. I am a computer teacher, and can certainly see the value of including radio theory in the school curriculum. As for project building, I do like to experiment when I find the time, but keep in mind that readers such as myself may not have the level of expertise that the hams who are writing the articles have.

Noted. By the way, "time" is a rationalization. You have the time to do what's important to you. It's not time, it's priorities. We all have the same 168 hours a week. . . . Wayne

Name withheld, ARRL employee "I get tired of all the lids complaining on packet, SSB, CW, etc., about 'those idiots in Newington.' If they put half the effort into at least writing to their directors instead of bitching over the air, they'd probably be much happier. You try to solve problems, the world will be a better place. Keep up the good work and keep on bashing the lazy members."

W. Richard G. Duane, Jr. WB2VAT, Long Valley NJ I was amused by what your staff did to Dave's (W5UN) article, "Two Meter EME Primer" in the March issue. On page 52, bottom of column 2, the word "libration" (the oscillation of the moon's face as seen from earth) was changed to "libation" (drinking)!

I agree that libration effects are short-term. However, I do not agree that libation effects are very short-term! I enjoyed the article all the more for the laugh it gave me unexpectedly in the middle of a very informative and interesting piece.

If only all our mistakes were so entertaining!. . . Linda KA1UKM

Walter Lindley NL7VM After all your nagging I have finally upgraded from Technician to Advanced. It seems that everyone who talks about code claims it is either easy or nearly impossible to learn. Nonsense; code is tough to learn, but with some practice it *will* come. I think a codeless license is great because technically-oriented people (as opposed to code-oriented people) are needed in this hobby. Let's all welcome any new people attracted to ham radio through the no-code license.

Malcolm G. Bowen VE6MGB, Ft. McMurray, Alberta I just finished reading "Random Output" in the January 1991 issue, and I would like to shake your hand!! I agree with you wholeheartedly.

In November 1989 I became interested in amateur radio. I approached a member of the local ham club, and he was very helpful. I purchased a used FT-101 at a garage sale from a ham operator and it turned out he became a good friend. A month or two later, I joined the ham club. I was informed that night classes would be starting soon.

I turned up the first night along with 12 other people. The second week, only 10 turned up; the following week, six came, and in the last 10 weeks of the 18-week course, only two of us showed up. Myself and the other participant appreciated both amateur operators teaching this course, and expressed our thanks. I took my exam and passed, the other person didn't try the exam.

Now this is the part that burns me, and I have told all the club members so!! At a general meeting at the end of summer, 18 people turned up, and we talked about everything. But not one word about myself and the other gentleman sticking out the night courses through winter at −25 degrees, or even that I had passed my exam. I waited until the meeting ended, and there was nothing said, and I swore I would never attend another club meeting. Can you imagine how a new member would feel in that kind of atmosphere? I thoroughly enjoyed your article and found myself agreeing with everything you wrote. Thank you for your patience and the opportunity to voice my opinion.

Thanks for sharing your experience. Unfortunately, we've received dozens of similar letters. I'm glad you told your club how you feel. Maybe it will help (but I doubt it).

What struck me most about your letter was the fact that your licensing class took 18 weeks. 18 weeks!!!??? No wonder you had so many dropouts! If it's run correctly, it shouldn't take more than 8 weeks (or is there something peculiar about the Canadian license that requies 1/3 of a year to learn?). . . . David N1GPH

Fred Smith K3MOA, York PA After following the code vs no-code debate for what seems like an eternity, I am pleased to see that the FCC finally made the most logical and rational decision on the matter. I am one of the many unfortunate ones who had to suffer through learning code to obtain my license, but I would not wish that "rite of initiation" on my worst enemy. . . . Though the FCC has made its decision, I expect that the debate will go on forever or until the code fanatics die off. Max Planck summed it all up when he wrote: "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that is familiar with it."

I hope that we are able to spawn that new generation so that amateur radio doesn't die out with the code fanatics.

Nice quote. Max was too science-oriented. The quote holds water even when you take the word "scientific" out of it. . . . Wayne

Joe Plitnick KA1WPD, S. Meriden CT While attending the 31st Tropical Hamboree Amateur Radio/Computer Show in Miami, Florida, a situation developed that I think is quite amusing. While visiting your exhibition booth I was given a copy of *73* at no charge. I really appreciated it and I signed up for a subscription. While visiting other displays I came up to . . . *[another ham magazine.]* It was kind of strange to see that they were charging one dollar for their current issue. I commented to the staff working the display that I received a free copy of *73*. The reply was, "Well, that's all it's worth." Amazing. I have since decided to stop purchasing this magazine and sister publications. I enjoy your *whole* magazine. Thanks again for the free issue. Keep up the good work.

Hi, Joe—I remember meeting you in Miami. This kind of adolescent name-calling has been going on for years among the major ham magazines. Kinda' stupid, isn't it?. . . David N1GPH

E.J. Kidd, III, WD4ILS, Naples CA Over the years, I have been a retail purchaser and subscriber to your magazine. I have never agreed so completely with your observations on the general wrong-headedness of many of our ham brethren.

Every leisure activity which can be divided into groups seems to suffer from periodic infusions of petty authoritarians bent upon enforcing the "rules." Small Minds will find a way to smite the assembled faithful with the Rules, and attempt to convince them that some particular loss of individual freedoms is Good For Them.

There is a scatological Southernism that, to paraphrase it, attributes the desire to enforce discipline upon smaller groups to a void in one's sex life. So, for years I have assumed that old men with callsigns from the first and second districts, holding ARRL posts and Extra tickets, tended to be petty authoritarians and general noxious busybodies because the lack of ultraviolet rays in the Northeastern winters attenuated their libidos. What a revelation, if your hypothesis is correct! Facing Newington and genuflecting five times daily doesn't make one an old fart: CW makes one an old fart!

Having read much on EMF and cancer, becoming interested due to your editorials, I often chastise emergency services workers and hams for using those cute microphone/rubber duck antenna combinations which they gleefully pin and clip to their lapels and epaulets. Two meter energy radiated 8" from one's eyes is probably not a great idea; 70cm radiation from an antenna closer to the brain than the elbow can be shown, according to some tests in the '60s and '70s, to be hazardous to one's eyesight. But *what* does the emission of 800 MHz cellular telephone signals from all those Nokia and Motorola units up right next to the ear do for the brain? Can we expect a Yuppie Brain Disorder in the 21st century?

The current ratio of Agreement/Disagreement between the NSD editorials and my own views is running about 70:30 in the last five years. I find this an alarming trend, inasmuch as I celebrated my 40th lap around the sun last year. Instead of a young, wild-eyed Cracker who disagreed with you about 70% of the time and burned the tires off my mobile, I now look like Wilfred Brimley, find more wisdom in the counsel of those with more experience, and am trying to cut my own personal dependence on foreign oil by a few barrels a week. Not quite ready for Old Farthood, I did reregister as an Independent this year.

It's interesting that your agreement factor has risen with wisdom—why, it's almost enough to make a person think! Perhaps it's time to dig back through old rags and recheck old editorials and see how well they've withstood the test of time—vs your take at the time. Please advise. . . . Wayne

Michael A. Sciomacco N3HUX, Pittsburgh PA I've been a *73* subscriber for a year, and I've gone from nothing to General in 13 months. I am using your advice about bringing ham radio to my students at the Greenway Middle School Teacher's Center. This past summer I instructed a Novice class sponsored by the New Futures extended day program, and elmered a new Novice, Brian KA3WXH. I am currently starting a new Novice/Tech class. I am also awaiting the installation of our Cushcraft vertical to get on 10 meters.

During a recent demo at Greenway, I had a real life emergency that required me to contact 911 and a child's parent through 2 meter autopatch. A student had fallen down a hill and cut her foot open on a broken bottle. The students were able to view firsthand how I was able to lend a hand.

I also occasionally take check-ins for a local swap and shop repeater net. This gives me great personal satisfaction, and I feel all hams should contribute to our hobby in whatever capacity that they can, and not look down their noses at the young. I.E. "Lids"! (We have a local club that screens their applicants and will not admit young hams. What a crock!)

Thanks for your inspiration. I am becoming an "unreasonable" person.

Ervin L. Sly, Nipomo CA Have been reading your editorials for a long, long time, and even though I don't always agree with everything you say, I enjoy them. Have always been very envious of all the things that you do, *but* it takes money to do it with. I "just ain't never had none of that stuff to do all those things," and your March editorial finally told me why. Just don't have the I.Q. for it!

I have had Advanced ticket for 51 years. I just retired a few years back, and I had to spend what little I made on my family, and not extras, like the hobby or traveling. Guess it's too late now to get smart!

I hope the no-code ticket brings in lots of new hams. 73

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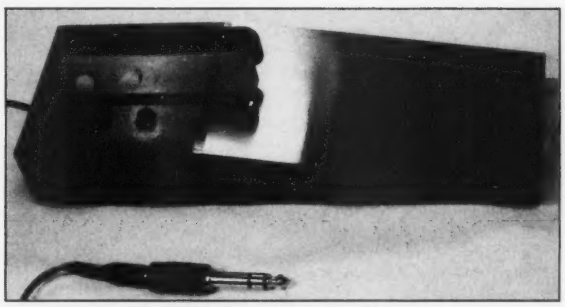

No moving parts. . . see page 9.

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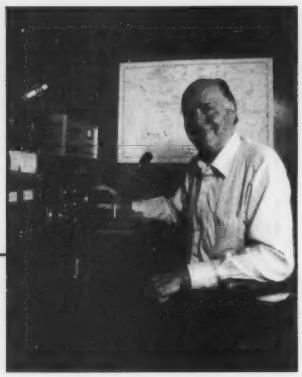

NEVER SAY DIE

Wayne Green W2NSD/1

FCC Screws Up!

The FCC has tried to kill an ant with a sledgehammer. Actually, though I'm dumping on the FCC, it's mainly our own fault that this nonsense happened.

By now, unless you've been living in a black hole, you know that a ham who was protesting our attacking Iraq sent a message through a packet system asking people at the other end to make a 900-number call. Since there's a charge for 900 calls, an FCC engineer, alerted to this terrible crime, started issuing fines right and left, and in general dumping on a number of hams whose packet stations relayed the message. Talk about overreaction!

Yes, it was in bad political taste to question President Bush's decision to clobber Iraq. And yes, we're not supposed to use amateur radio to generate money for causes. But the crime here was more on the order of a yellow-line violation than a hanging offense. We've been used to hearing worse attempts at using amateur radio to sell things than that . . . like those endless solicitations for subscriptions to a ham magazine (not mine, darn it) via supposed information bulletins.

For years we've bragged about how great we are at being self-regulating and self-policing. Then, whenever an Extra Class CW-crazed ham goes berserk on the air, the first thing we do is go whining to the FCC, demanding they put the SOB off the air. Do we do anything about it ourselves? You bet we do! We sit there, wringing our hands and complaining for a while before we telephone the FCC.

The FCC engineers, delighted to find an incident where they are on the moral high ground for a change, have leaped into this mess with an atom bomb to pacify a flea. FCC, get the heck off our backs and stop being dumb. Yes, we know we're not supposed to handle messages that involve making money for someone. That doesn't mean that some ham somewhere isn't going to do it. And it doesn't mean that you have to close down the hobby just because we have a few idiots.

A message going through a packet system, no matter how illegal, isn't going to do a lot of harm. Let's put this baloney into perspective. Most ops don't even bother to read the traffic being relayed through their stations. Like a repeater, they're providing a service.

So what should we do? Is it time to start trying to write new regulations that will allow us to cope with this dire emergency? Or is it time to stop being silly? I vote for the latter. We need fewer regulations and less unneeded harassment from the FCC.

If we are such wimps that we can't handle the creeps who've been screwing up 20m with unwanted broadcasting, officious net jamming and pile-ups on DX, then we deserve all the miseries we have. Yes, of course the ARRL could do something about it. I happen to think they not only should, but that it's their responsibility to keep our bands clean. And I think ill of you for being a member and being too afraid to tell them what you think . . . and for endlessly voting for directors who refuse to do anything.

Now tell me how you don't agree with everything I write. What part don't you agree with?

When I Grow Up . . . ?

Yes, I know, most of us are in our 60s and it's difficult to remember when we were kids and we'd wonder what we might do when we grew up. But suppose you get into a position where you are going to be a mentor to a youngster—what kind of advice would you give?

It's difficult to look back from retirement age and assess what we've done with our lives. It can be even more difficult when we think about what we might have done.

If you were to be in a position to mentor teenagers, what guidance could you give them? Could you point to your own success and the impact you've made on the world as an example of what's possible for them?

What did you want to be when you grew up? Did you make it? Or have you gone on way beyond anything you imagined? Or have you fallen far short of your dreams?

If you're short, is it too late to try again?

Amateur radio can be the key which unlocks a lifetime of excitement and growth. When my friend Alfie and I were given a box of old radio parts one Sunday in church, Alfie had little interest in the junk, so I took it home. The "angel" who gave that box of old parts to two kids that day changed one of their lives.

I joke that one of the great tragedies of my life was when the *Popular Mechanics* radio I built with those parts worked. It was a turning point. Perhaps this is one reason why I'm so anxious to touch as many kids' lives as possible with the magic of radio.

How can a teenager understand enough about how life works to set any realistic goals? Perhaps, as a mentor, we who've been through it can help explain about the attractiveness of the pitfalls. How can we get across the importance and the fun of learning when kids are up to here in lousy teachers, menacing peers, impossible parents, and threats of war and destruction?

How can we explain in terms they can understand that there are an infinite number of ways in which the world will try to head them off? That Darwinian survival of the fittest really does work, even on a personal level?

We have a wide variety of drugs for the body and the mind, all geared toward keeping them from success. There's alcohol, which their parents, television and the movies try to convince them is cool. Smoking doesn't have quite the cachet it did a few years ago, but with the uneducated it's still cool. Junk food and overeating are pushed at us from every side.

How about junk food for the mind such as ball games (of all kinds), 95% of the television fare, most movies, comic books and most newspapers? There are a lot of junk books too . . . and junk music.

How easy it is to get involved with shortcuts where you substitute a belief for the more difficult work of learning and understanding. In this category I'd put politics and every religion except yours. I've put together a whole long list of very worthy causes, any of which can derail your progress through life.

I'm as aware as you of the dangers to Gaia. I keep up on the redwood loss, the rain forest destruction, the whales, dolphins and baby seal losses, the greenhouse effect, and even that poor little snail darter that sidetracked a billion dollar dam project.

Yes, I see how the world is coming apart. I know about the race problems all around the world, the tribal enmities everywhere. The wars in Iraq, Timor, Chad, Somalia, Ethiopia, the Philippines, Central America, New Guinea. The killing of students in China and Burma. And many of these are personal with me because I've visited these places and have friends in them.

My ham friends in Czechoslovakia and Poland, whom I visited just last year, are deeply involved on a daily basis with the turmoil in these countries, so what's happening in Eastern Europe is more than a passing news item for me. I've been to Wenceslaus Square in Prague. I've seen the hundreds of candles burning for those killed in fighting communism. I've sat and talked, ham to ham, with the people who are living through this terrible period.

Amateur radio has a whole world to offer, if only you can get this message across to the youngsters around you. It isn't easy. They're probably much more interested in Nintendo and collecting bubble-gum cards.

How much do you know about amateur radio? How much have you taken advantage of this cornucopia of wonder to expand your own horizons? How can you communicate the wonders amateur radio offers if you've never yourself even tried them?

Can you get up in front of your ham club and explain how RTTY works? Are you comfortable with bauds and digital communications? How'd you like to tackle spread spectrum for the club? How about writing an article on it for *73*? Or even a book? Why not? I've written many articles and books on RTTY, so why not you? Oh, *I'm* different in some way? How? Why?

Yes, of course I'm different. We're all different. But we all have to accept responsibility for the way we are—and change it if we're not satisfied.

When I was growing up I hadn't a clue as to what I wanted to do. Which was just as well, since most of the things I've done couldn't have been predicted. How could I imagine as a high school student getting involved with amateur radio that this would lead me in a few years to being an electronics technician on a submarine in the middle of a war?

Television was just barely starting when I was in high school so how could I guess that I'd become a TV director a year after getting out of college? Or that I'd become a professional psychologist a year later? I wouldn't have believed it! And then a couple years later I was the partner in a million dollar loudspeaker manufacturing business. Things like this are completely unpredictable, aren't they?

Or are they really? Yet wasn't I following some general goals all along? Most of my life was determined when that box of radio parts was given to me in church that Sunday. Yet even then I was ready for it. Alfie had the same opportunity, but he wasn't able to take the next step. How about you? Are you missing opportunities the way Alfie did?

Through the magic of amateur radio I've sat and talked with a king in his

Continued on page 73

KENWOOD

Mobile Companion!

TM-241A
TM-441A/TM-541A

Compact FM Mobile transceivers

Here are your new mobile companions – at your service whenever you're on the road! Their compact size makes installation a snap, and the remote control options allow you to customize your installation for that "professional" look!

- **Wide band receiver coverage.** The TM-241A receives from 118–173.995 MHz. Transmit range is 144–148 MHz. (Modifiable for MARS and CAP operation, permits required.)
- **TM-441A** covers 438–449.995 MHz, and the **TM-531A** covers 1240–1299.995 MHz.
- **CTCSS encode built-in, selectable from the front panel.**
- **Selectable frequency steps** for quick and easy QSY.
- **TM-241A provides 50 W. TM-441A 35 W, and TM-541A 10 W.** Three power positions, 5, 10, and full. The TM-541A has two power positions, 1 and 10 watts.
- **20 full-function memory** channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2m is automatically selected.** There are **four channels** for "odd split" operation.
- **Tone Alert System with Elapsed Time indicator.**
- **Auto-power off function, and time-out timer.**

RC-20 Remote Control Unit
As supplied, one RC-20 will control one transceiver. **Most often-used front panel functions** are controllable from the RC-20. The RC-20 and IF-20 combine to allow control of up to four radios.

- **Selective calling and pager option.** The DTU-2 option enables the Dual Tone Squelch System (DTSS), allowing selective calling and paging using standard DTMF tones.
- **Digital recording system option.** Used in conjunction with the tone alert system, the DRU-1 allows message storage of up to 32 seconds.
- **Multiple scanning functions.** Band and memory scan, with selectable scan stops and memory channel lock-out.
- **Large LCD display with four-step dimmer control.**
- **Automatic Lock Tuning (ALT) for the TM-541A.** Compensates for drift.
- **Supplied accessories.** Mounting bracket, DC cable, fuses, MC-44DM multi-function DTMF mic.

Optional accessories
- **DRU-1** Digital Recording Unit
- **DTU-2** DTSS unit • **IF-20** Interface unit, used with the RC-20, allows more than two transceivers to be remotely controlled • **MA-700** 2m/70cm dual band antenna with duplexer (mount not supplied) • **MB-201** Extra mounting bracket • **MC-44** Multi-function hand microphone • **MC-55** (8-pin) Mobile mic. with time-out timer • **MC-60A, MC-80, MC-85** Base station mics. • **PG-2N** Extra DC cable • **PG-3B** DC line noise filter • **PG-4G** Extra control cable • **PG-4H** Interface connecting cable • **PG-4J** Extension cable kit • **PS-50/PS-430** DC power supplies • **RC-10** Handset remote controller • **RC-20** Remote control head • **SP-41** Compact mobile speaker • **SP-50B** Mobile speaker • **TSU-6** Programmable CTCSS decoder

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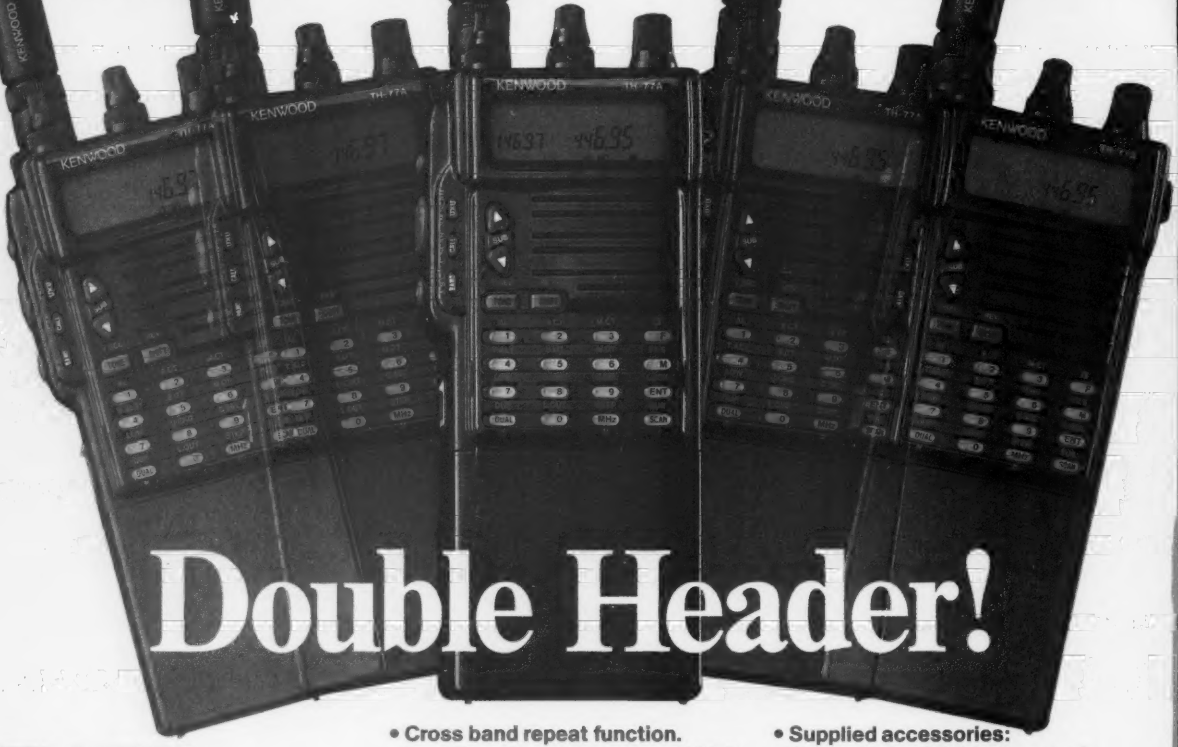

Double Header!

TH-77A

Compact 2m/70cm Dual Band HT

Here's a radio that deserves a double-take! The TH-77A is a feature-packed dual band radio compressed into an HT package. The accessories are compatible with our TH-75, TH-25, and TH-26 Series radios. Repeater and remote base users will appreciate the DTMF memory that can store *all* of the DTMF characters (*, #, A, B, C, and D) that are usually required for repeater functions!

- **Wide band receiver coverage.** 136–165 (118–165 [AM mode 118–136] MHz after modification) and 438–449.995 MHz. TX on Amateur bands only. (Two meter section is modifiable for MARS/CAP. Permits required.)
- **Dual receive/dual LCD display.** Separate volume and squelch controls for each band. Audio output can be mixed or separated by using an external speaker.
- **Cross band repeat function.**
- **Dual Tone Squelch System (DTSS).** Uses standard DTMF to open squelch.
- **CTCSS encode/decode built-in.**
- **Forty-two memory channels.** All channels odd split capable.
- **DTMF memory/autodialer.** Ten 15-digit codes can be stored.
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **Multi-function, dual scanning.** Time or carrier operated channel or band scanning.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- **Two watts (1.5 W on UHF) with supplied battery pack.** Five watts output with PB-8 battery pack or 13.8 volts. Low power is 500 mW.
- **DC direct-in operation** from 6.3–16 VDC with the PG-2W.
- **T-Alert with elapsed time indicator.**
- **Automatic repeater offset on 2 m.**
- **Battery-saving features.** Auto battery saver, auto power off function, and economy power mode.
- **Supplied accessories:** Flex antenna, PB-6 battery pack (7.2 V, 600 mAH), wall charger, belt hook, wrist strap, keyboard cover.

Optional accessories:
• **BC-10:** Compact charger • **BC-11:** Rapid charger • **BH-6:** Swivel mount • **BT-6:** AAA battery case • **DC-1/PG-2V:** DC adapter • **DC-4:** Mobile charger for PB-10 • **DC-5:** Mobile charger for PB-6, 7, 9 • **PB-5:** 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6:** 7.2 V, 600 mAh NiCd pack • **PB-7:** 7.2 V, 1100 mAh NiCd pack • **PB-8:** 12 V, 600 mAh NiCd for 5 W output • **PB-9:** 7.2 V, 600 mAh NiCd with built-in charger • **PB-11:** 12 V, 600 mAh OR 6 V, 1200 mAh, for 5 W OR 2 W • **HMC-2:** Headset with VOX and PTT • **PG-2W:** DC cable w/fuse • **PG-3F:** DC cable with filter and cigarette lighter plug • **SC-28, 29:** Soft case • **SMC-30/31:** Speaker mics. • **SMC-33:** Speaker mic. w/remote control • **WR-1:** Water resistant bag.

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Specifications and features are subject to change without notice or obligation.

QRX . . .

EDITED BY LINDA RENEAU KA1UKM

New Rules Sought

The FCC has accepted a petition requesting that primary responsibility for the content of all automatically retransmitted signals be placed on the originating station. The petition, authored by Tom Blackwell N5GAR of Dallas, Texas, was designated RM-7649. It calls for a modification of Part 97, adding to Section 97.205 a section (g).

The licensee of the repeating station, whether analog or digital, would hold only a secondary responsibility for the re-transmission. Basically, he would be held responsible only to the extent that it was humanly feasible for him to intercept and censor the violation. Conversely, the user breaking the rules of the Amateur Radio Service would be the one to suffer the most severe consequences of the violation.

Earlier, the ARRL had also submitted a proposal to the FCC on this matter, but it was turned down. Blackwell feels that his petition may be successful because it calls for some measure of shared responsibility. The ARRL proposal, he said, regarded the originator solely responsible for his message.

Last January, as reported in the April "QRX," a number of packet BBS operators were fined $300, and others were cited for allowing the re-transmission of an anti-war message urging users to call a 900 number. The message did not mention the $10 fee that would be charged to the caller's phone bill. The sysops of the packet BBS stations have responded to the allegations of impropriety, but the matter is still on hold. They don't know if they will be exonerated or penalized further.

Jim Dearras WA4ONG, one of the hams cited, says, "I believe it [RM-7649] will go a long way in taking care of the problem." He pointed out, however, that "primary" and "secondary" responsibilities ought to be better defined. He added, "I am also concerned that a lot of hams do not seem to understand what has really happened. They don't see the implication as going beyond the packet BBS systems having to screen messages. They don't realize that this can be applied to digipeaters and voice repeaters!"

N5GAR said that he wrote his rules change petition to include both analog and digital modes, so that separate regulations would not be necessary. From No. 597 of the *Westlink Report.*

Balloon Experiments

Look for a student balloon experiment which will be launched at 10:00 a.m. EDT on April 27 from the U.S. Naval Academy in Annapolis, Maryland. The balloon will take a 2m FM transmitter (144.34 MHz) up to about 80,000 feet. Telemetry will consist of a CW ID (W3ADO Balloon) and a series of tones indicating inside/outside temperature and altitude. Anyone within 400 miles may hear the signal. They'll be using a 40-foot diameter dish to track the payload as it drifts along. See Photo A. Contact Bob Bruninga WB4APR at the Aerospace Dept., U.S. Naval Academy, Annapolis MD 21402, or call (301) 267-4380.

Photo A. WB4APR atop the 40-foot tracking dish at the U.S. Naval Academy.

Spring balloon launch schedule:

April 13 at 7:30 a.m. CDT, Franklin IN (WB9IHS). Live camera ATV on 439.25 MHz. 2m FM on 144.34 MHz. 10m CW on 28.321 MHZ. HF nets on 3.871 and 28.331 MHZ. Contact Chuck Crist WB9IHS at 6455 S. Madison Ave., Indianapolis IN.

Mid-April, Hillsboro WI (WB9SBD). Two meter repeater. Input of 144.48 MHz and output on 147.48 MHz. HF net on 7.155 MHz. Contact Joe WB9SBD, Rt.1 Box 235A, Hillsboro WI 54634.

May 4 at 9:30 a.m. MDT, Denver CO (AA0P). Live camera ATV on 426.25 MHz. 2m FM with voice telemetry on 144.34 MHz. 10m CW on 28.8 MHz. HF nets on 7.232 and 28.332 MHz. Sponsored by Edge of Space Sciences, Inc. Contact Jack Crabtree AA0P at 4327 Bellewood Dr., Littleton CO 80123.

May 11 at 9:00 a.m. CDT, Houston TX (WB5HLZ). Live camera ATV on 439.25 MHz. 2m FM packet and CW telemetry on 147.435 MHz. 10m CW on 28.322 MHz (K7IRK). HF nets on 7.155 and 28.332 MHz. Contact Burns Cleland WB5HLZ at 5106 Elm St., Houston TX 77081.

May 18 (morning), Whiteville NC (KC4WDW). Students at Southern Community College plan to launch a TV camera into space. See the ATV column in this issue for details.

June 15 (morning), Mojave Desert (W6BHZ). Student members of the Society of Women Engineers (SWE) at Cal Poly University in San Luis Obispo, California, plan to fly an atmospheric sampling experiment up to 80,000 feet on a large balloon. Telemetry downlink will be on 2m FM with live camera ATV on 434 MHz. Write to the Cal Poly Amateur Radio Club, UU Box 53, Cal Poly University, San Luis Obispo CA 93407 (attn: David Fichou KB6OEN).

June 29 at 9:30 a.m. EDT, Dayton OH (W8BI). Live camera ATV on 439.25 MHz. 2m FM with voice ID on 144.34 MHz. Twenty meter CW on 14.035 MHz using a Ramsey QRP-20 kit. HF net on 7.232 MHz. Contact Dayton ARA W8BI (DARA), P.O. Box 44, Dayton OH 45401-0044. *De Bill Brown WB8ELK, 73 editor.*

SWLing for News

Over the past few months, the sale of shortwave receivers has gone up 500%. Every country is selective about the news it broadcasts, and every country broadcasts some amount of propaganda, or material intentionally slanted to some degree, for its purposes. Many people have turned to shortwave to get the latest news faster, and also to compare reports of the same events.

Israel at 9435 (also at 7465 and 11605) kHz gives you right up-to-the-minute reports at 7, 8, 9, and 11 p.m. EDT. The BBC in London reports news about world events that you may not hear in the U.S.A. Listen on 5975, 6175, 7325, and 9915 kHz. A station in Dubai seems relatively unbiased; listen for it at 11 a.m. EDT on 11795, 13675, 15320, 15400, 21605, and 21675; and at 10:30 p.m. on 13675, 15400, and 15435 kHz. At 7 p.m. EDT, you can hear Moscow on 15205 or 15330; or at 8:30 p.m. on 7400, 9750, 15180, and 1770 kHz. Budapest, Hungary, is on 9835 (no time given) kHz. Iraq has been heard on 11990 or 9022 kHz in various languages. Kuwait was on 11990 (using a Saudi station?). Syria tells their side on 9950 and 12085 between 3:05 and 5:10 p.m. These are only a few of the many, many broadcasts on the air. *Frequencies listed are from* B-N-T Bulletin, *Vol. 19, Issue 3.*

Scanner Law Inquiry

Early this year, the ARRL submitted a request to the FCC, now known as Docket 91-36, that it pre-empt licensed amateurs from local scanner laws. State and local laws may prohibit the possession of ham radios—even by hams—if these radios also cover po-

QRX . . .

Tabitha Carty N1IEQ is a member of the NSRA home repeater on 146.88.

lice or other public safety frequencies deemed illegal to listen to.

Laws vary from state to state. New Jersey requires police-issued shortwave radio permits; Kentucky law authorizes officials to seize and destroy any radio equipment capable of receiving police signals; a Michigan statute exempts licensed amateurs—except for Novices and Technicians!

The ARRL pointed out that most 2m transceivers receive a range of frequencies between 139–174 MHz, which includes many public safety frequencies. The League believes that regulation is solely a federal function, and should not be left to the states. However, three of the five FCC commissioners studying the proposal have already said that they don't want to pre-empt local laws; instead, they want to know how *existing* ham transceivers and scanners could be modified to remove any capability to receive public safety radio frequencies. Under this proposal, new scanners and ham gear would have to be designed to *skip* public safety bands!

The FCC is also trying to figure out if there should be an exemption for General Mobile Radio Service licensees and equipment. Many hams, agencies, and groups use the 460 MHz GMRS, one of the Part 95 personal radio services. Then there is the Association of North American Radio Clubs, representing unlicensed shortwave listeners. It has asked for a general pre-emption for licensees and non-licensees alike.

The idea that owners of existing equipment might be required by the FCC to delete frequencies, and that newly manufactured receivers would be designed without the ability to pick up police, fire, and medical communications, is an unprecedented idea. *TNX* W5YI Report, *Vol. 13, Issue #5.*

What Counts

Tabitha Carty N1IEQ, a 13-year-old General class licensee, has been a ham for almost a year. She and her father, Joe KA1EXZ, do a lot of ATV demos at radio clubs and schools. The last demo was for an audio/video class at the Danvers High School. She is also a member of the NSRA home repeater on 146.88.

Tabitha is a student at Middle School West in Salem, Massachusetts. She holds an A–B average, and is being considered for the National Honor Society.

"I'm jealous of the kids with ham radio clubs in their schools," she writes. "Kids at my school think I'm nuts (hi, hi). I like ATV and ham radio, and that's all that counts." *TNX Tabitha N1IEQ, for responding to the request for information.*

Drake is Back!

R.L. Drake is back with a new shortwave receiver—the R8. From the early '50s to the early '80s, Drake offered a wide array of shortwave and ham equipment. For about the past eight years, it has concentrated its resources on its satellite receiver business.

The new shortwave receiver, called the R8, operates in the AM, LSB, USB, CW, RTTY, and narrowband FM modes, and covers from 100 kHz to 30 MHz. With an optional module, the R8 can also cover fire, police, public service broadcasts, and additional amateur bands in VHF (35–55 MHz and 108–174 MHz).

For more information, contact the R.L. Drake Company, P.O. Box 112, Miamisburg OH 45342.

Radio Video

"More Than Radios" highlights the importance of bringing others into the hobby. This 28-minute video was created and produced by Zman Productions, which is owned by Chuck KE7SA and Dixie N7OYY Zappala of Bothell, Washington. It was filmed in towns throughout Washington State.

"More Than Radios" video tapes are free, but there is only a limited number of them. For availability, contact ICOM America, Inc., 2380 116th Avenue N.E., Bellevue WA 98004. A tape must be ordered on ham club letterhead stationery. *TNX* Digital Digest. *Vol. 4, No. 1, and ICOM.*

Novice/Tech 80M Change

The Novice/Tech subband on 80 meters has been moved down to 3675–3725 kHz. The former privileges were from 3700–3750. If you're studying for a license, be sure to make this change in your books. If you have a frequency and mode allocations chart, you might want to note this change on it, too. *TNX* B-N-T Bulletin, *Vol. 19, Issue 3.*

Number One Ham

Ten-year-old James Catalano KC4SZT is the first of four Cub Scouts in Webelos Den 1 of Pack 1189 to pass his Novice exam. Now he is studying for his Technician ticket. He has been operating mostly 10 meters, and he has already confirmed DX QSOs with countries as far away as Australia.

Like many boys his age, he enjoys playing video games at home on TV. But he also enjoys the martial arts and playing the piano. He has recently earned his orange belt in Tae-Kwon-Do. *TNX Denis Catalano.*

James Catalano KC4SZT, a Cub Scout in Webelos Den 1 of Pack 1189, has his Novice ticket.

The Copperhead Keyer Paddle

The perfect touch!

by Charles D. Rakes KI5AZ

How many times have you wanted to try your hand at sending CW with an iambic keyer paddle, but didn't want to spend Mom's grocery money just to find out if it's really your cup of tea? Or maybe because you're just plain tired of trying to keep your mechanical monster adjusted? Or because you're still looking for that spring that took off like a ballistic missile? Whatever your reasons, you could consider building the "Copperhead Keyer," and enjoy the serenity of a nonmoving, nonmechanical, no-nonsense, electronic touch-activated keyer!

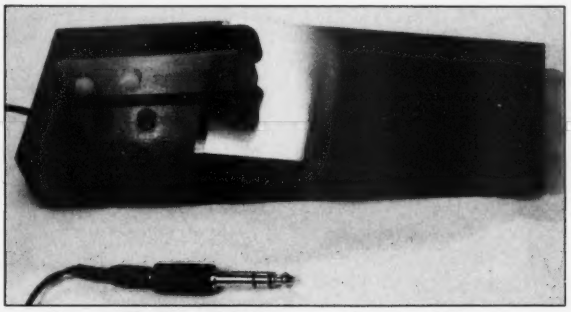

Photo A. The Copperhead Keyer—an ingenious alternative.

The Copperhead Keyer was especially designed for the home project builder who can take advantage of a few simple skills and fabricate a useful piece of equipment for a fraction of the cost of a similar commercial item. If you are a good parts scrounger—and what seasoned ham isn't?—you probably can build your own version for less than ten bucks. You can also order a kit (see the Parts List).

The paddles will operate with most commercial and home-constructed electronic keyer circuits using the Curtis chip, including the built-in versions in many current transceivers.

How the Keyer Works

Take a look at the keyer's schematic diagram in Figure 1, and you'll see just how easily electronics can replace a mechanical device. Also notice that an on/off switch isn't used or required because the standby current is so minuscule. The battery could survive in standby for its normal shelf life.

A single 4093 CMOS quad 2-input NAND Schmitt trigger IC and two 2N3904 transistors control and direct the circuit's electron flow. The two unused NAND gates are electrically stabilized by tethering their gates to circuit ground. The keyed output is fed through a mini or standard ¼-inch stereo phone plug to mate up with the majority of electronic keyers.

The "dit" (left) paddle is connected to the input of gate "A" through a 100k resistor, and back to battery positive through four series 10 megohm resistors. The very small current flow through the 40 meg resistor string holds the input high. In standby the gate's output, pin #3, is low. When the paddle is bridged, through your skin resistance, to circuit ground, the gate's output goes positive, turning Q1 on.

Q1's collector switches any positive load connected to the tip of the phone plug to ground, holding it there until the ground bridge is broken at the paddle. The "dah" paddle circuit operates in a like manner, with Q2 doing the output switching. The inputs of both gates are RF-bypassed with a 39 pF capacitor.

Building Your Own Copperhead Keyer

The paddle's physical configuration can be just about anything you desire, or you can duplicate my model as shown in the figures. You can bread-board the circuit, or use perf-board. For a neat package, follow the PC board layout. If you do the breadboard method be sure to use an IC socket. No matter what scheme you follow, be sure to take special care in handling and installing the CMOS chip.

Woodchucking: See Figures 3 and 4. The keyer's base is shaped out of a hardwood block 3" x 8½" x 1¼", to match the drawings in Figure 2. A 2½" x 2¼" x 1" cavity is

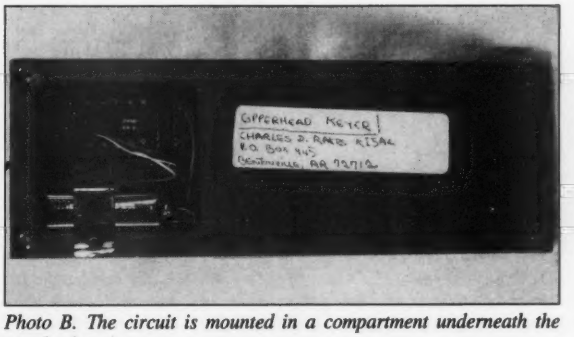

Photo B. The circuit is mounted in a compartment underneath the wooden housing.

Parts List for the Copperhead

B1	9 volt transistor battery
C1,C2	39 pF ceramic disc cap
C3	0.1 µF ceramic disc cap
IC-1	4093 quad 2-input NAND Schmitt trigger
Q1,Q2	2N3904 NPN transistors
R1,R2	100k, ¼ watt resistors
R3-R10	10 megohm resistors
R11,R12	4.7k resistors
Phone plug	stereo mini or standard, ¼-inch plug

Misc.: Hardwood material, circuit board material, battery snap, battery holder, nylon hardware, solder lugs, wire, solder, etc.

You can obtain a complete kit of parts, including a shaped base and spacer ready for stain or paint, paddles, hardware, circuit board, and all components postpaid for $27.95 from the author at Krystal Kits, PO Box 445, Bentonville AR 72712.

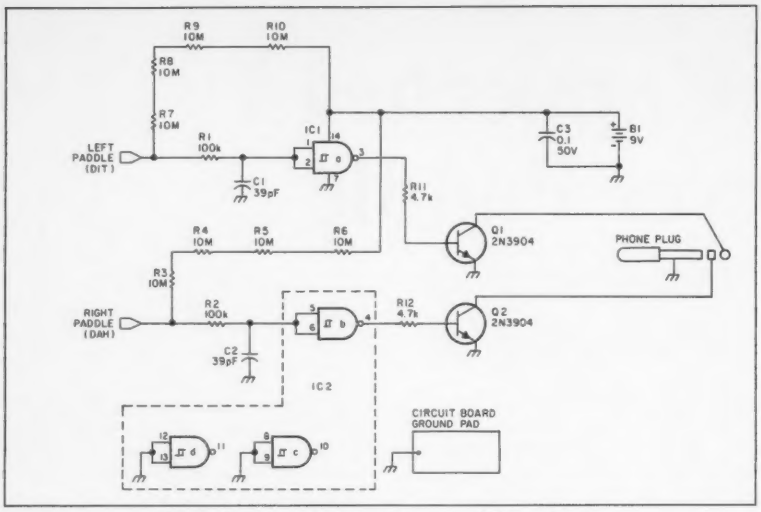

Figure 1. Schematic for the Copperhead Keyer circuit.

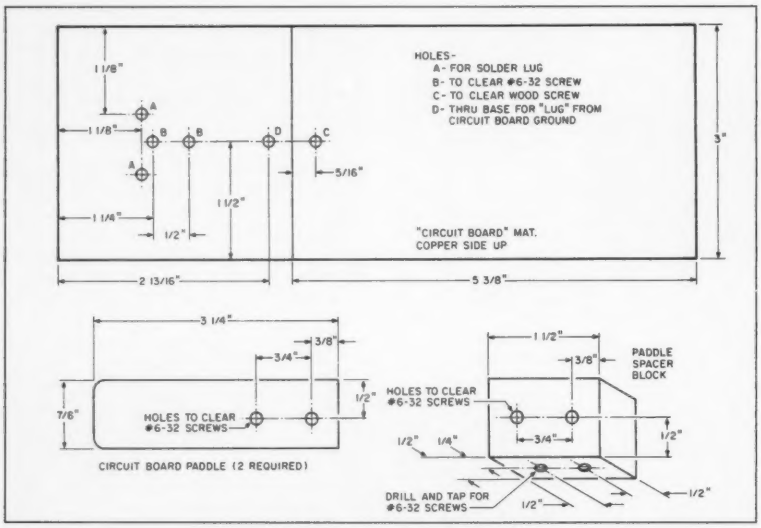
HOLES-
A- FOR SOLDER LUG
B- TO CLEAR #6-32 SCREW
C- TO CLEAR WOOD SCREW
D- THRU BASE FOR "LUG" FROM CIRCUIT BOARD GROUND
"CIRCUIT BOARD" MAT. COPPER SIDE UP
HOLES TO CLEAR #6-32 SCREWS
CIRCUIT BOARD PADDLE (2 REQUIRED)
PADDLE SPACER BLOCK
DRILL AND TAP FOR #6-32 SCREWS

Figure 3. Plate dimensions.

carved from the base to hold the circuit board and battery.

A paddle spacer is cut to the dimensions, as shown in Figure 2, from the same hardwood material. The two paddles are cut from circuit board material to the size and shape shown in Figure 3. Two holes are drilled in each paddle to match up with the two holes in the spacer block, and the corners of one end of each of the paddles is rounded with a file or belt sander. The edges are smoothed with a fine grit sandpaper.

After the above is accomplished, you can drill the paddle mounting holes through the side of the spacer block, as shown, and then drill two holes in the bottom of the spacer. Thread each for a 6-32 metal screw. Drill four holes in the base, and mount the spacer board in place with two 5/8-inch 6-32 screws.

The grounding board, a section of circuit board 5⅜" x 3", is mounted to the keyer's base with glue and a single wood screw. A long solder lug extends from the wood screw through a hole in the base (see photo of completed keyer) to the cavity where it connects to circuit ground.

The paddles are mounted to the spacer with nylon 6-32 screws and nuts. A long solder lug on each paddle is secured by the nylon hardware and extends through the base connecting to the circuit as shown in Figure 1, the schematic.

Figure 4 shows the component side of the circuit board and parts placement. Mount the parts as shown and solder them in place. Then connect the paddles, grounding pad, battery snap, and output plug wires to the circuit board.

Mount the circuit board to the inside of the cavity with a ¼" plastic spacer and wood screw. The battery is kept in place with an L-bracket made from a spring steel, 9 volt battery holder, and is mounted to the edge of the cavity with a wood screw.

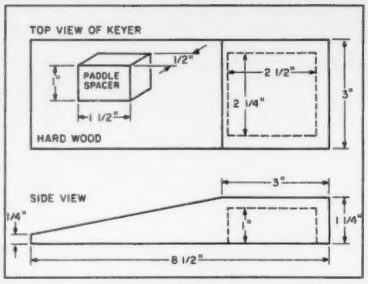

Figure 2. Dimensions for the wooden housing.

Checking Out the Keyer

With a battery in place, take a VOM in the RX-1 position and connect the positive lead (don't rely on red to mean positive, check it out) of the meter to the tip of the keyer's output plug and the meter's negative lead to the common sleeve on the plug. Position your wrist on the grounding pad and touch the "dit" (left) paddle. The meter should go from infinite resistance to near zero. To check the "dah" (right) paddle, first connect the positive meter lead to the ring on the phone plug. Next, with the negative still attached to the sleeve, touch the right paddle; the meter should drop to near zero ohms. If so, your copperhead keyer is ready for service. 73

Charles D. Rakes KI5AZ, P.O. Box 445, Bentonville AR 72712.

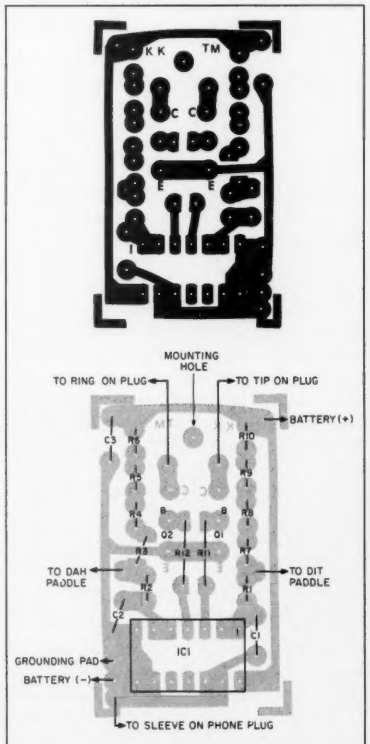

Figure 4. (a) PC board foil pattern. (b). Component placement.

The Handy Inductance Bridge

For measuring small coils.

by J. Frank Brumbaugh KB4ZGC

Hams who home-brew antenna tuners, VFOs, QRP transmitters, and receivers are usually faced with determining the values of small inductances. While there are expensive digital and analog instruments available commercially, their cost and capabilities usually exceed the budget and actual needs of the average ham. Even most of the inductance measuring devices described in the ham literature seem overly complex, and often require hard-to-find component parts. The instrument described here is a simple, inexpensive but very useful gadget for quickly measuring the inductance of small coils.

Description

The circuit is illustrated in the figure. A Pierce crystal oscillator is isolated from the bridge circuit by an emitter follower which applies approximately 2 volts rms (root-mean-square amplitude) at the crystal frequency across the bridge.

The unknown inductance is connected in series with the bridge variable capacitor, which is then tuned to balance the bridge, as indicated on the center-zero microammeter. The inductance of the unknown is indicated on the calibrated dial.

This instrument, which operates at a frequency of 5 MHz, is capable of measuring from about 1 µH to 30 µH. This range encompasses the vast majority of those small coils that need to be measured accurately.

Theory of Operation

The Pierce crystal oscillator, and the emitter follower, together comprise the generator that provides operating voltage to the bridge. The bridge is the heart of the instrument. L2 and C6 in series form the two fixed, known legs of the bridge.

The values of 22 µH and 47 pF were chosen to be series resonant at the 5 MHz crystal frequency. Because of the phase relationship between voltage and current in a series circuit, there is approximately 3.6 volts rms of RF at the junction of L2 and C6 when approximately 2.1 volts rms of RF is applied across the bridge, measured to ground. This allows greater voltage variation across the null detector formed by the center-zero meter and back-to-back diodes, which makes the null indication easier to determine accurately.

The back-to-back diodes, D1 and D2, are required both to rectify the RF voltage and to allow the center-zero meter needle to swing to both sides of center so an accurate null can be obtained. Although the diode conduction "knees" will appear at the center zero null, slightly broadening it, this does not adversely affect bridge accuracy.

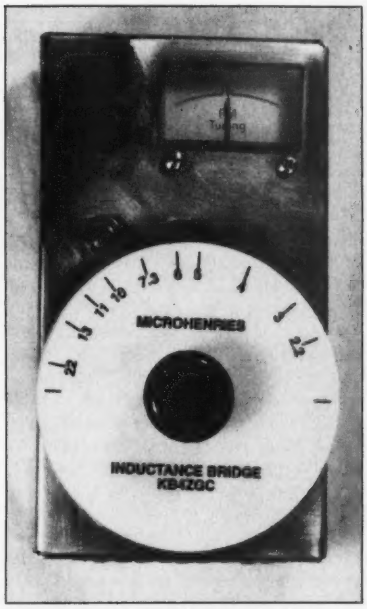

Photo A. The Inductance Bridge.

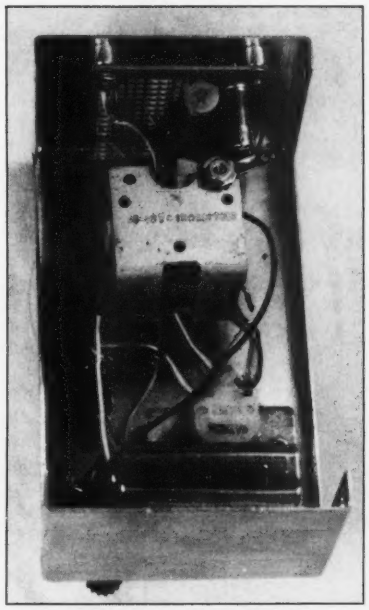

Photo B. Internal view of the bridge.

You can use crystals of other than 5 MHz, but if you do, you *must* change the values of both L2 and C6 so they are series resonant at the chosen crystal frequency.

Bridge tuning capacitor C7 is a nominal 365 pF variable capacitor removed from an ancient broadcast receiver. With this value capacitor and a bridge frequency of 5 MHz, inductances from about 1 µH to 30 µH can be measured accurately.

Using a smaller or larger capacitor and retaining the 5 MHz bridge frequency will shift the range over which inductances can be measured. Using a different frequency crystal (and changing the values of L2 and C6 appropriately) will also shift the range of measurement. However, regardless of the bridge frequency, the minimum capacitance of C7, plus stray circuit capacity, establishes the minimum measureable inductance.

Because the bridge frequency must be stable for accurate measurement of inductances, a crystal oscillator must be used. Any crystal oscillator circuit can be used—but the Pierce is the simplest and most foolproof. Remember, though, if you use a different crystal frequency, you may have to use different values of feedback capacitors C1 and C3.

This instrument is powered by a 9 volt battery to make it portable. You may use almost any DC voltage between about 6 and 15 volts. Using a 9 volt battery, total current drain is less than 15 mA.

An LED in a "free current" circuit is included as a power-on indicator. Because total operating current flows through the LED, it does not increase the load on the battery. Also, the LED will grow dimmer as the battery is depleted through use, alerting you to replace the battery.

The bridge is designed so that its tuning capacitor, C7, has its rotor plates grounded, simplifying construction and eliminating hand capacity from interfering with the accuracy of measurement.

Construction

The Inductance Bridge must be constructed in a shielded enclosure. An aluminum box, or an enclosure made from double sided PC-board material, may be used.

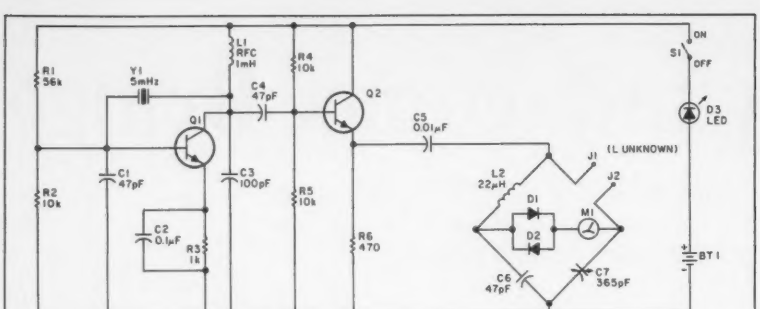

Figure 1. Schematic for the inductance bridge.

All of the circuitry can be constructed on a small piece of perf board, or a printed circuit board (such as Radio Shack 276-150). Keep RF wiring short and direct.

Install the binding posts J1 and J2 at one end of the enclosure, as far as possible from bridge tuning capacitor C7. *You want your fingers to be as far away as possible from the field around the unknown inductance being measured.*

Use stiff solid wire to connect C7 to J2, and from J1 to the junction of C5 and L2.

The 9 volt battery can be held in a clamp made for that purpose, or attached to the inside of the enclosure with a strip of Velcros™.

Parts Used

All parts used in this instrument, except the enclosure, came from my junk box (yes, I have a DEEP junk box, having been a ham since 1949). I used an aluminum box approximately 2″ x 3″ x 4″ which I got for $1.50 at a hamfest.

Q1 and Q2 can be any small signal NPN transistors, such as 2N3904, 2N4124, 2N2222, etc.

L1 is an RF choke. Anything from about 390 µH to 2.5 mH can be used. The value is somewhat dependent upon the crystal frequency. Use a 2.5 mH choke at 1 MHz, or 390 µH at 10 MHz, for instance. The actual value is not of great importance as long as sufficient RF voltage is applied to the bridge.

L2 is a 22 µH RF choke; it's an important part of the bridge when a 5 MHz crystal oscillator is used to power it, as described earlier. Any 22 µH coil could be used here if its value is known accurately.

Meter M1 is a surplus FM tuning meter, center-zero, with a 200 µA movement. You can use any similar meter that's sensitive; 50–0–50 µA or 100–0–100 µA movements are suitable. Similar meters are available from Micro-Mart Inc., 508 Central Avenue, Westfield NJ 07090, and other mail-order dealers, for about $2.00. *[Ed. Note: A suitable meter is also available from Hosfelt Electronics, Inc., (800) 624–6464; part# MHE 5, the 100–0–100 µA meter.]* If you cannot locate a center-zero meter, there are numerous small edgewise and standard 100 or 200 µA meters which, with care, can usually be changed to indicate center zero. Carefully remove the cellophane tape holding the meter together and remove the front section to allow access to the movement. *Very carefully* push the long metal lever extending from the movement to one side while watching the meter needle. This will often allow movement of the needle to rest at the center of its scale. You may have to use needle nose pliers or the end of a screwdriver to move this lever. Use extreme care so you won't deform the lever or break the tiny spring attached to it.

CAUTION: These small edgewise meters, often calibrated in TV channel numbers, do NOT have a zero-adjust: DO NOT ATTEMPT TO USE A JEWELER'S SCREWDRIVER ON THE TINY SCREW AT THE CENTER OF THE MOVEMENT! This is a pivot screw, and tightening or loosening it may damage or destroy the meter movement.

Not all such meters can be modified to put the needle at the center, but most can be. Even if it is impossible to move the meter needle to the center of its range, if it can be moved a half-inch or so, it can be used, marking the meter scale at the new needle position as "zero."

Parts List

BT-1	9-V battery
C1,C4,C6	47 pF silver-mica capacitor
C2	0.1 µF disc capacitor
C3	100 pF silver-mica capacitor
C5	0.01 µF disc capacitor
C7	365 pF variable tuning capacitor (see text)
D1,D2	1N914, 1N4148, 1N34A, 1N60, etc.
D3	LED
J1,J2	Binding post
L1	RF choke, 1 mH (see text)
L2	22 µH RF choke
M1	100–0–100 µA center-zero meter
R1	56k, ¼W, 5% resistor
R2,R4,R5	10k, ¼W, 5% resistor
R3	1k, ¼W, 5% resistor
R6	470 ohm, ¼W, 5% resistor
S1	SPST toggle or slide switch

Note: A blank PC board is available from FAR Circuits, 18N640 Field Court, Dundee IL 60118 for $4 +$1.50 postage. Please indicate this article when ordering.

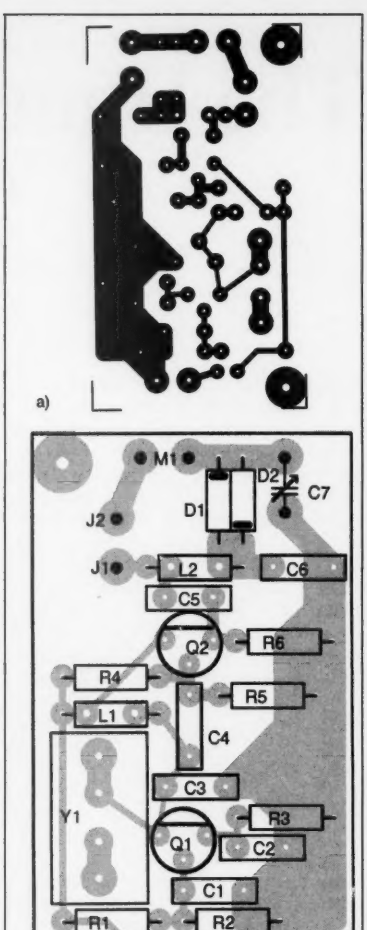

Figure 2(a). PC board foil pattern. (b). Parts placement.

Bridge tuning capacitor C7 may be difficult to locate if you do not have one in your junk box. Your best bet is to check with local hams and radio-TV repair shops. If this doesn't produce a usable capacitor, any hamfest should offer a wide selection. You may also find a suitable tuning capacitor from Fair Radio Sales, PO Box 1105, Lima OH 45802, (419) 227–6573 or from Antique Electronic Supply, (602) 820–5411; part# CV–230.

You can obtain crystal Y1, a 5 MHz surplus microprocessor crystal, from most mail-order dealers, as they offer a wide selection of these crystals of various frequencies. A 5 MHz HC-25 crystal is $1.25 from BCD Electro, PO Box 450207, Grand Prairie TX 75045-0207. They stock inexpensive crystals in the range of 33 kHz to 143 MHz, as do many other mail-order dealers.

Continued on page 18

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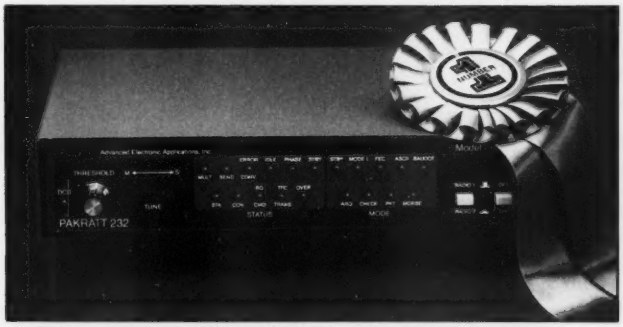

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The Mini-Keyer

A smaller and newer version of an old friend.

by Klaus Spies WB9YBM

Ten years ago, for a high school project, I built my first keyer using a schematic from Howard Berlin's *555 Timer Application Sourcebook, With Experiments*. When I upgraded to General, the keyer was a bit sensitive to 1 kW (the audio oscillator made a chirpy noise), but the unit served me well for many years. There were ample nooks and crannies behind which to hide this large box, but there came a time when I felt an upgrade was due, for several reasons.

First, most (if not all) modern rigs have a built-in sidetone oscillator, so I no longer needed one built into the keyer. Deleting this part of the circuit, as well as the speaker, made me curious to see how small the keyer could actually be made—not because I needed more room on my table (compared to my 2 kW amp and TR-7, even the original circuit was small), but to keep up with the modern trend of compactness and the design challenge it entailed. The keyer could very easily be powered from a regulator, so an unregulated, dirty and cheap wall transformer ($7 at Tri-State Electronics in Mount Prospect, Illinois, or about $9 at any Radio Shack) can be hidden away under the hamshack table, on the same bus the transceiver plugs into.

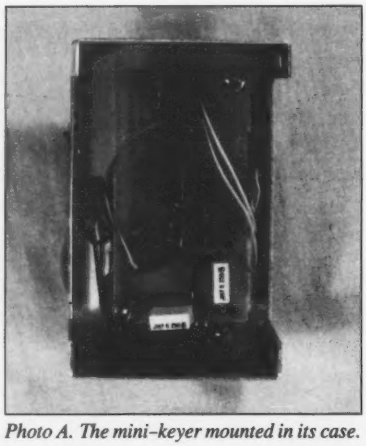

Photo A. The mini-keyer mounted in its case.

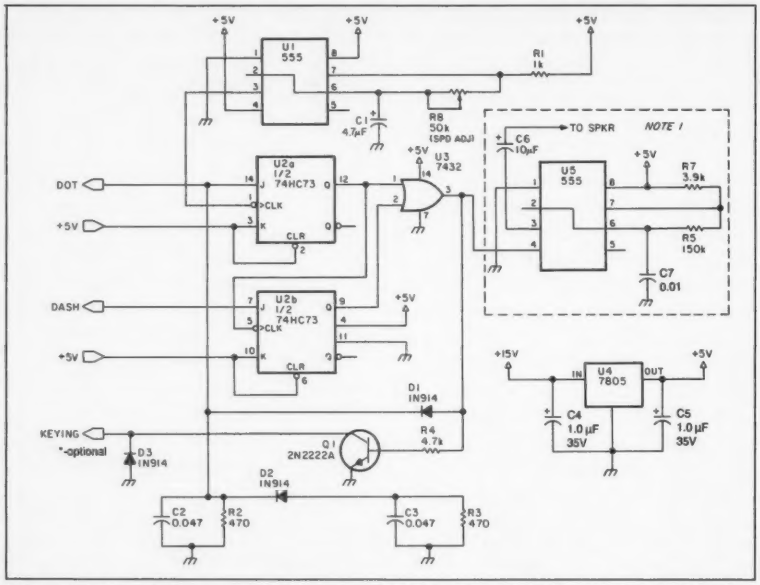

Figure 1. Schematic diagram of the keyer (modified from the original keyer in Howard Berlin's 555 Timer Application Sourcebook, With Experiments.

Although the majority of hams have a 12 volt power supply available in their shack to power their mobile VHF/UHF transceivers, I wanted to design in as much independence as possible into this keyer. If you want to use this keyer for Field Day, for example, it can be plugged into the same 110 volt generator powering the HF rigs, so there's no need to lug along a 12 volt supply. The only other option would be to power the circuit with a 9 volt battery, but who wants one of those things running out of juice in the middle of a QSO?

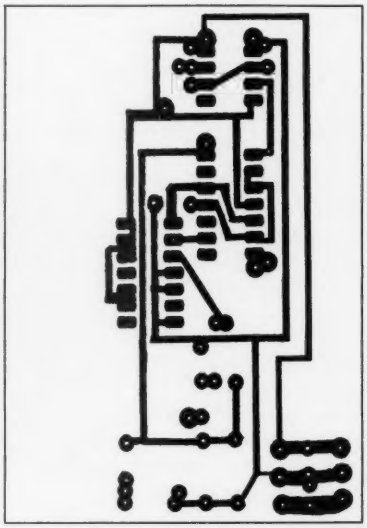

Figure 2. PC board foil pattern.

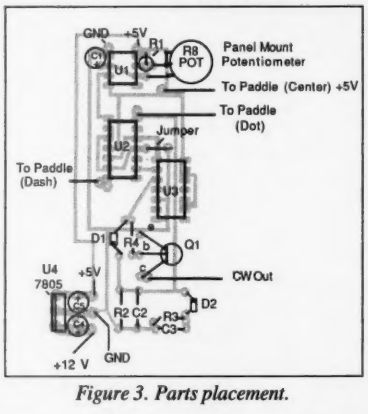

Figure 3. Parts placement.

I also made a minor circuit modification. The dual NOR gates (the second acting as an inverter) were replaced with a single OR gate. Although the typical OR gate IC available on the market has plenty of gates to spare (there are four per package), it seemed to be poor engineering practice to use gates just because they were there. See Figure 1. A 6 volt relay can be driven by the 2N2222A transistor, if additional isolation is required or desired between the keyer and the HF rig.

For final assembly, I used a deep-drawn

Continued on page 18

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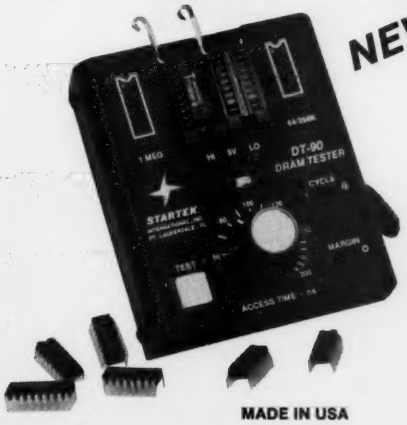

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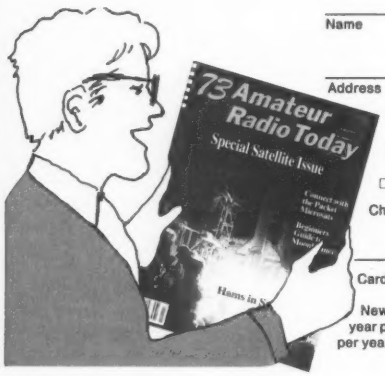

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CIRCLE 194 ON READER SERVICE CARD

The Mini Keyer

Continued from page 14

aluminum box, put bypass capacitors as well as ferrite beads on all of the incoming and outgoing leads, and kept holes in the box to the absolute minimum.

I have used this new keyer for several months, and have found no problems in operation.

Contact Klaus Spies WB9YBM at 8502 N. Oketo Ave., Niles IL 60648-2006.

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Belmont CA 94002
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Parts List

U1	555 IC timer
U2	74HC73 IC
U3	74HC32 IC
U4	7805 voltage regulator
Q1	2N2222A transistor
D1,D2	1N914 diode
R1	1k resistor, ¼W
R2,R3	470 ohm resistor, ¼W
R4	4.7k resistor, ¼W
R5	50k potentiometer
C1	4.7 µF/35V electrolytic capacitor
C2,C3	0.047 µF ceramic capacitor
C4,C5	1.0 µF/35V electrolytic capacitor

Optional side-tone generator
(enclosed by dotted line in Figure 1)

U5	555 IC timer
R6	150k resistor, ¼W
R7	3.9k resistor, ¼W
C6	10 µF/35V electrolytic capacitor
C7	0.01 µF ceramic capacitor
SPKR	8 ohm speaker

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CIRCLE 280 ON READER SERVICE CARD

The Handy Inductance Bridge

Continued from page 12

All other components are items most hams already have on hand, or which can be found at Radio Shack. An excellent source for numerous small parts, components, and semiconductors/ICs is: Short Circuits, PO Box 285, Barnegat NJ 08005. Send them a postcard requesting their free catalog.

Calibration

The simplest way to calibrate this instrument is by connecting known values of inductance between J1 and J2, tuning C7 for a null, and marking the value on the dial. The circle cut from a panel to make a hole for a meter makes an excellent dial plate which can be epoxied to the tuning knob. You also might merely use a pointer knob and make calibration marks on the panel.

Most mail-order dealers carry a wide selection of small value RF chokes suitable for calibration. These are generally ±10% tolerance, sufficiently accurate for most purposes, and come in values from below 1 µH to around 3 mH. A few small RF chokes used singly, and in series and parallel, will provide numerous calibration points over the range of this instrument. Generally these chokes cost between 20¢ and 60¢ each, depending upon value.

Operation

With the instrument turned off, connect the unknown coil between the binding posts, J1 and J2. Rotate the bridge tuning capacitor C7 so the plates are fully closed—at the low inductance end of its range.

Turn the instrument on and note the meter needle swings to one side. Adjust C7 while watching the meter needle until the meter indicates zero. Read the value of the unknown inductance off the calibrated dial.

NOTE: *In some instances, when you tune C7 over its entire range, the needle may cross zero twice. The first zero indication when tuning from the low inductance range is the correct one.*

Assuming the bridge to be turned on and operating properly, if the meter needle does not move off center when C7 is tuned through its range, then either the coil being measured is open, or it is not properly connected to the binding posts.

If the meter swings to one side of zero and will not reach center as C7 is tuned through its entire range, then the inductance of the coil being measured is outside the range of the bridge—it's either too large or too small.

Cost

If all new (surplus) parts must be purchased, this Inductance Bridge should cost no more than ten dollars. This can be reduced by what you have on hand, can trade for, or get from other hams or at hamfests.

You may write to J. Frank Brumbaugh KB4ZGC at 82 Liddell Street, Buffalo NY 14212-1824.

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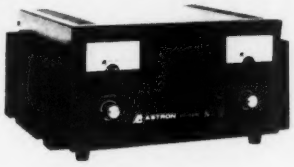

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SL-11A	•	•	7	11	2¾ x 7⅝ x 9¾	11

RS-L SERIES

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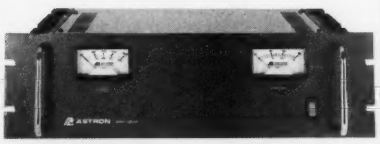
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7



RM SERIES

MODEL RM-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• 19" RACK MOUNT POWER SUPPLIES				
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

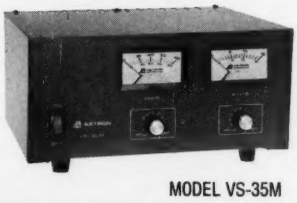
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES



MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

Covert Hamming

A design for your next secret mission.

by Eldon Ryan K6BRP

Several years ago a major manufacturer of two-way radios designed a handheld exclusively for those with the need for unobtrusive communication, such as the FBI.

The radio had no internal speaker, microphone, or push-to-talk button. It was a handheld that didn't need to be hand-held. It could be concealed in a coat pocket or carried by belt clip. The PTT wiring was routed down the operator's coat sleeve and activated by a push-button in the palm. The miniature microphone was pinned under the necktie or lapel of the coat. The only telltale evidence of a concealed radio was the ear piece, which resembled a hearing aid.

This rig had a price tag of nearly three hundred dollars.

For less than five dollars, you can turn your HT into a device that operates on the same principles. You can use the remaining two hundred ninety-five dollars to build the other great projects that appear in *73*.

No originality is claimed for the following project, since the idea has been around and in use for some time. Numerous good articles have appeared about how to adapt Star Sets, Radio Shack headsets, booms, and mikes to your HT.

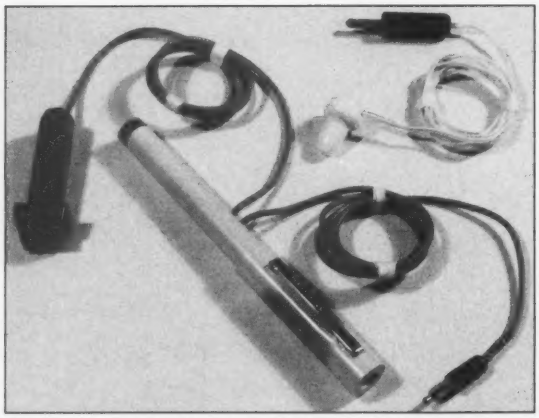


Photo A. The microphone may be concealed in a defunct pen housing. (Photo by Andy N6KAS.)

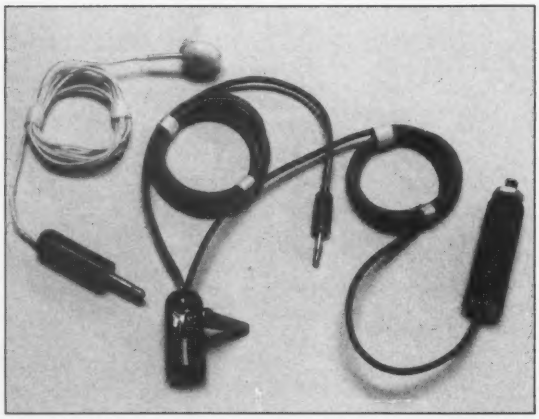


Photo B. You can also build the microphone into a phone plug housing. (Photo by Andy N6KAS.)

Let's go undercover....

First, here are two microphone design ideas: You could build it inside a defunct pen housing (see Photo A); or you could use the plastic housing from a quarter-inch phone plug (see Photo B).

The plastic "barrel" can be cut in half to reduce the size, and a mini alligator clip can be attached to the assembly with a very small self-tapping screw solidified with epoxy. The plastic barrel of a quarter-inch phone plug can also serve as a mounting for the PTT button switch (see Photo C).

Figure 1 is a schematic of an electret condenser microphone as it may appear in the operator's manual you originally received with your HT. Figure 2 is the schematic of the modified version.

Notice that the radio is keyed in series with the microphone.

A voltage is required for an electret microphone. This voltage, of course, is supplied by the radio.

It may or may not be necessary to decrease this voltage, the mike bias, but you can do it by placing a resistor of 1.5k or 2.2k ohms across the mike element. A 0.001 µF bypass capacitor may also be necessary. You can determine the correct value of the resistor by observing the deviation on a service monitor or deviation meter while speaking into the microphone. Keep in mind that you are not going to be talking directly into this microphone as you would your SPKR/MIC or the internal mike of your radio.

The microphone element can be a Radio Shack 270-090 or All Electronics Corporation MKE-2 (I recommend that you send for the All Electronics catalog. It's loaded with lots of goodies at bargain prices. See their ad in this issue).

Ignore the schematic on the back of the Radio Shack package, but DO observe polarity. The *high* side goes to the PTT button. Notice that there are no shields connected to the mike element.

The All Electronics element has

Continued on page 85

Parts List

2	24-inch lengths of shielded wire	RS 278-752
1	electret microphone element	RS 270-090
	or All Electronics Corporation	# MKE-2
1	momentary contact push button switch	RS 275-618 or equiv.
1	mike plug	RS 274-289 or RS 274-286*
2	¼" phone plugs, plastic housing	junk box
1	2.2kΩ ⅛W resistor	junk box
1	0.001 µF capacitor	junk box
1	mini alligator clip	junk box

*Depending on the type of radio you have.

Note: The microphone and miscellaneous parts can be obtained from All Electronics Corp., P.O. Box 567, Van Nuys CA 91408. Telephone: (800) 826-5432.

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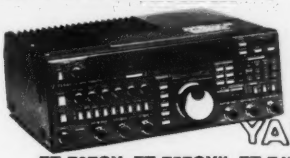

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FT411E-811-911 IC02AT/32AT
FTH-2008/7008 IC2/4GAT/24AT
IC-A20/U16

Landmobile HT's
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YAESU: FTH 2008/7008
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MARINE ICOM: M5, M56, M700
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IC-H16/U16

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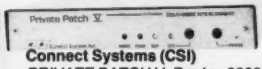

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CIRCLE 41 ON READER SERVICE CARD

Software for the Ham Shack, Part I

Useful ham calculations you can program yourself!

by Bill Clarke WA4BLC

The computer is commonplace in ham shacks. In fact, I would say that next to the old HF rig, it is the most common resident of the typical station. Over the next four months, I'm going to show you how to use the computer to aid you in building, repairing, modifying and designing ham equipment by doing your mathematical computations. Let's say that I am going to show you how to broaden the scope of computer usage in the shack.

Each month I'll include new computer programs. Each of these programs will consist of separate modules, or building blocks, that will become a ham radio computer system, menu driven and user friendly.

The program part for this month includes a portion of the MAIN MENU, a module for the design of antennas, and a module for measuring the physical lengths of transmission lines. Each month, as more modules are included, the MAIN MENU will grow.

Main Menu

The completed MAIN MENU will resemble this:

```
MAIN MENU FOR THE (your callsign)
          HAM SYSTEM

    1 - ANTENNA DESIGN MATH
    2 - TRANSMISSION LINE MATH
    3 - OHM'S LAW
    4 - POWER FORMULAS
    5 - EFFICIENCY FORMULA
    6 - RADIO HORIZONS
    7 - OHMS TO RESISTOR COLORS
    8 - RESISTOR COLORS TO OHMS
    9 - AIR COIL INDUCTANCE
    X - FINISHED USING

    ENTER YOUR SELECTION
```

Notice the place for "your callsign." After all, this is your system.

Module One

Antenna design is just about as basic to amateur radio as you can get. Without antennas there is no radio operation. Of course, some math is needed when designing dipoles, vees, quarter-waves, etc. In fact, math is even needed when cutting ground radials for vertical antennas. This program module asks the user to enter a frequency (in MHz), to which it then responds with the electrical wavelength for that frequency. Additional responses include all the normal fractional wavelengths (½, ¼, etc.). The dimensions for a dipole cut to that frequency are given, as are the measurements for radials.

Module Two

Many recent antenna articles call for a quarter wavelength of transmission line for one reason or another, usually as a matching transformer. As in the antenna module, the user is prompted to enter the frequency of design. The computer responds with physical lengths for quarter- and half-wavelengths of the popular coaxial transmission lines in use today. This module bases its computations on velocity factors.

About the Programs

The program modules given in this series of articles are written in BASIC. Most hobby computerists understand BASIC, and their computers understand it as well. It is a relatively universal language, usable on IBM ™, clones of them, Atari ™, Apples ™, and the Commodore ™ series of computers. It may well be, however, that some slight modification to the programs will be needed to run them on your particular machine. Although written in GW BASIC for use on a clone, I have attempted to make the programs as transportable between the various brands as possible. Program modifications are noted for the Commodore at the end of each article in the series.

Entering a Program Listing

Entering a program listing into your computer is very easy, although it calls for exacting accuracy. No mistakes can be tolerated. To err will cause a failure sooner or later. Generally sooner!

Depending on the system you have, set it up to operate on BASIC. Once ready to operate in BASIC, type in the listing as it is given. For example:

```
10 PRINT "MAIN MENU"
```

What you actually type is: 10 space PRINT space "MAIN space MENU" (the quote marks get typed also). Then you press ENTER (or the RETURN key on some machines). In other words, type exactly what you see. Be sure to type in capital letters, just like the program listings show.

That's all there is to it. Of course, there are quite a few lines to enter, so take your time and be careful. Oh yes: *In line 12, type your callsign in place of the six X's.*

After you have completed typing in all the lines, you must SAVE your work.

Alternative methods of program entry, such as WordStar in nondocument mode, are permissible.

Saving Your Work

Saving a program is very simple. Place a FORMATTED blank disk in the disk drive, then type SAVE "HAM1" (on the Commodore, type SAVE "HAM1",8) and press ENTER. HAM1 is the name we are giving to the first section of the overall HAM program.

There is a reason for saving a program before trying to use it. This will all become very clear in a few minutes.

Using the New Program

LOAD the new program by typing LOAD "HAM1" (LOAD "HAM1", 8 on the Commodore) and pressing ENTER. When the computer signals READY on the screen, type RUN and press ENTER.

The next thing you should see is the MAIN MENU for your new Ham System. It should show three selections: ANTENNA DESIGN MATH, TRANSMISSION LINE MATH, and FINISHED USING. Go ahead and put the program through its paces. Try a few frequencies for test purposes.

HINT: If the menu selections fail to respond, try locking the keyboard into upper case (caps).

Should you enter into a menu selection you don't want, press the ENTER key until a small menu appears in the lower left corner of the screen that gives you the option to press M for MAIN MENU.

If you have an error in anything you see on the screen, such as wording, typos, or a computer failure or lockup, then reset the computer. Again LOAD the program (as before). However, instead of running it, you will LIST it. Listing shows everything you typed in from the program listing. To list: type LIST and press ENTER.

Sometimes when a program fails, it will cause the computer to halt operation completely. This is called a lock-up. The only way to get it going again is to reboot it. Rebooting usually equates to turning the computer off, then back on. This will cause a complete loss of all data and programs that were in the computer's memory. If you had not saved your program to disk, it would be gone. To get it back, in that case, you would have to re-enter it from the listing. Now you see why the program was saved before it was run. ALWAYS SAVE YOUR WORK BEFORE RUNNING IT.

While checking the listing, if you see an error, use the CURSOR keys to move the cursor to the incorrect line. Make the correction, then press ENTER. ENTER is pressed

COMMUNICATIONS ELECTRONICS INC.

Emergency Operations Center has expanded to our new two acre facility and World Headquarters. Because of our growth, CEI is now your *one stop source* for emergency response equipment. When you have a command, control or communications need, essential emergency supplies can be rushed to you by CEI. As always, for over twenty two years, we're ready, willing and able to help.

Our RELM two-way radio transceivers were especially created for government agencies. When you need to talk to police, fire, ambulance, or state, federal and international response forces, RELM transceivers may be quickly programmed for up to 48 frequencies. Listed below, are some of our most asked about transceivers. For additional assistance, call CEI at 313-996-8888.

NEW! RELM® RSP500-A

List price $465.00/**CE price $319.95/SPECIAL**
20 Channel • 5 Watt • Handheld Transceiver
Frequency range: 148-174 MHz. continuous coverage. Will also work 134-148 MHz. with reduced performance.
The *RELM* RSP500B-A is our most popular programmable 5 watt, 20 channel handheld transceiver. You can scan 20 channels at up to 40 channels per second. It includes CTCSS tone and digital coded squelch. Snap on batteries give you plenty of power. Additional features such as time-out timer, busy-channel lockout, cloning, plug-in programming and IBM PC compatability are standard. It is F.C.C. type accepted for data transmission and D.O.C. approved. We recommend also ordering the **BC45** rapid charge 1½ hour desk battery charger for $99.95, a deluxe leather case **LC45** for $48.95 and an external speaker microphone with clip **SM45** for $59.95. Since this radio is programmed with an external programmer, be sure to also order one **PM45** at $74.95 for your radio system.

NEW! RELM® UC102/UC202

List price $128.33/**CE price $79.95/SPECIAL**
CEI understands that all agencies want excellent communications capability, but most departments are strapped for funds. To help, CEI now offers a special package deal on the RELM UC102 one watt transceiver. You get a UC102 handheld transceiver on 154.5700 MHz., flexible antenna, battery charger and battery pack for only $79.95. If you want even more power, order the RELM **UC202** two watt transceiver for $114.95.

NEW! RELM® RH256NB-A

List price $449.95/**CE price $299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority Time-out timer • Off Hook Priority Channel
The *RELM* RH256NB is the updated version of the popular RELM RH256B sixteen-channel VHF land mobile transceiver. The radio technician maintaining your radio system can store up to 16 frequencies without an external programming tool. All radios come with CTCSS tone and scanning capabilities. This transceiver even has a priority function. Be sure to order one set of programming instructions, part # **PI256N** for $10.00 and a service manual, part # **SMRH256N** for $24.95 for the RH256NB. A 60 Watt VHF 150-162 MHz. version called the **RH606B** is available for $429.95. A UHF 15 watt, 16 channel similar version of this radio called the **LMU15B-A** is also available and covers 450-482 MHz. for only $339.95. An external programming unit **SPM2** for $49.95 is needed for programming the LMU15B UHF transceiver.

NEW! RELM® LMV2548B-A

List price $423.33/**CE price $289.95/SPECIAL**
48 Channel • 25 Watt Transceiver • Priority
RELM's new LMV2548B gives you up to 48 channels which can be organized into 4 separate scan areas for convenient grouping of channels and improved communications efficiency. With an external programmer, your radio technician can reprogram this radio in minutes with the **PM100A** programmer for $99.95 without even opening the transceiver. A similar 16 channel, 60 watt unit called the **RMV60B** is available for $489.95. A low band version called the **RML60A** for 30-43.000 MHz. or the **RML60B** for 37-50.000 MHz. is also available for $489.95.

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If you are the dealer or radio technician maintaining your own radio system, you **must** order a programming tool to activate various transceivers. The **PCKIT010** for $149.95 is designed to program almost all RELM radios by interconnecting between a MS/DOS PC and the radio. The **PM100A** for $99.95 is designed to externally program the RMV60B, RML60A, RML60B and LMV2548 radios. The **SPM2** for $49.95 is for the LMV25B and LMU15B transceivers. The **RMP1** for $49.95 is for the RMU45B transceiver. *Programmers must be used with caution and only by qualified personnel because incorrect programming can cause severe interference and disruption to operating communications systems.*

★★★ *Uniden CB Radios* ★★★

The *Uniden* line of Citizens Band Radio transceivers is designed to give you emergency communications at a reasonable price. Uniden CB radios are so reliable they have a two year limited warranty.

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WASHINGTON-A *Uniden* 40 ch. SSB CB base. . . . $209.95
PC122-A3 *Uniden* 40 channel SSB CB mobile . . . $113.95
PC66A-A *Uniden* 40 channel CB Mobile $78.95
PRO510XL-A3 *Uniden* 40 channel CB Mobile $34.95
PRO520XL-A3 *Uniden* 40 channel CB Mobile $49.95
PRO535E-A *Uniden* 40 channel CB Mobile. $73.95
PRO538W-A *Uniden* 40 ch. weather CB Mobile . . . $78.95
PRO640E-A3 *Uniden* 40 ch. SSB CB mobile $133.95
PRO810E-A *Uniden* 40 channel SSB CB Base . . . $174.95

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RD9GTL-A *Uniden* "Passport" size radar detector. . . $89.95
RD9XL-A3 *Uniden* "micro" size radar detector . . . $107.95
RD25-A *Uniden* visor mount radar detector $54.95

Bearcat® 200XLT-A

List price $509.95/**CE price $239.95/SPECIAL**
12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-A3** for only $179.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-A

List price $549.95/**CE price $239.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
Now...nothing excluded in the 806-912 MHz band.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-A** is available for $178.95.

NEW! Uniden® MR8100-A

Call 313-996-8888 for special CEI pricing
12-Band, 100 Channel • Surveillance scanner
Bands: 29-54, 116-174, 406-512, 806-956 MHz.
The *Uniden* MR8100 surveillance scanner is different from all other scanners. Originally designed for intelligence agencies, fire departments and public safety use, this scanner offers a breakthrough of new and enhanced features. Scan speed is almost 100 channels per second. You get four digit readout past the decimal point. Complete coverage of 800 MHz. band when programmed with a personal computer. Alphanumeric designation of channels, separate speaker, backlit LCD display and more. To activate the many unique features of the Uniden MR8100 a computer interface program is available for $19.95. Due to manufacturers' territorial restrictions, the MR8100 is not available for *direct* shipment from CEI to CA, OR, WA, NV, ID or UT.

NEW! Ranger® RCI2950-A3

List price $549.95/**CE price $259.95/SPECIAL**
10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Repeater Splits RIT • 10 Programmable Memory Positions
Frequency Coverage: 28.0000 MHz. to 29.6999 MHz.
The *Ranger* RCI2950 Mobile 10 Meter Transceiver has everything you need for amateur radio communications. The RF power control feature in the RCI2950 allows you to adjust the RF output power continuously from 1 watt through a full 25 watts output on USB, LSB and CW modes. You get a noise blanker, roger beep, PA mode, mike gain, digital VFO, built-in S/RF/MOD/SWR meter. Frequency selections may be made from a switch on the microphone or the front panel. The RCI2950 gives you AM, FM, USB, LSB or CW operation. For technical info, call Ranger at 619-259-0287.

RELM LMV2548B Only $289.95

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AD100-A Plug in wall charger for BC55XLT. $14.95
PS001-A Cigarette lighter cable for BC55XLT $14.95
VC001-A Carrying case for BC55XLT. $14.95
BC70XLT-A *Bearcat* 20 channel scanner. $159.95
BC142XL-A *Bearcat* 10 ch. 10 band scanner. $84.95
BC147XLT-A *Bearcat* 16 ch. 10 band scanner $94.95
BC172XL-A *Bearcat* 20 ch. 11 band scanner. . . . $134.95
BC177XLT-A *Bearcat* 16 ch. 11 band scanner . . . $134.95
BC590XLT-A *Bearcat* 100 ch. 11 band scanner. . . . $194.95
BC760XLT-A *Bearcat* 100 ch. 12 band scanner. . . . $254.95
BC002-A CTCSS tone board for BC590/760XLT. . . . $54.95
BC003-A Switch assembly for BC590/760XLT $22.95
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BC560XLT-A *Bearcat* 16 ch. 10 band scanner $94.95
BP205-A Ni-Cad batt. pack for BC200/BC100XLT. . . $39.95
TRAVELLER2-A *Grundig* shortwave receiver. $89.95
COSMOPOLIT-A *Grundig* shortwave receiver. . . . $199.95
SATELLIT500-A *Grundig* shortwave receiver $679.95
SATELLIT650 *Grundig* shortwave receiver. $949.95
ATS803A-A *Sangean* shortwave receiver. $159.95
74102-A *Midland* emergency weather receiver. . . . $39.95
77116-A *Midland* CB with VHF weather & antenna. . . $66.95
77118-A *Midland* CB mobile with VHF weather. . . . $62.95
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FBW-A Frequency Directory for Western U.S.A. $14.95
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RFD3-A DE, DC, MD, NJ, NY, PA, VA, WV Dir. $14.95
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RFD5-A AK, ID, IA, MN, MT, NE, ND, OR, SD, WA, WY . . . $14.95
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TIC-A Techniques for Intercepting Communications . . . $14.95
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EEC-A Embassy & Espionage Communications. . . . $14.95
SMH-A2 Scanner Modification Handbook, Vol. 2 . . . . $18.95
LIN-A Latest Intelligence by James E. Tunnell. $16.95
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CIRCLE 121 ON READER SERVICE CARD

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MC/Visa. Allow 3 wks for personal checks. Add $3 for COD. NC residents add 5% sales tax.

JPS Communications, Inc.
5516 Old Wake Forest Road
P.O. Box 97757 Raleigh, NC 27609
CIRCLE 285 ON READER SERVICE CARD

HAM1 Listing

```
 10 CLEAR : CLS
 11 PRINT : PRINT
 12 PRINT SPACE$(23);"MENU FOR THE XXXXXX HAM SYSTEM"
 13 PRINT SPACE$(23);"--------------------------------"
 14 PRINT SPACE$(26);"1 - ANTENNA DESIGN MATH"
 15 PRINT SPACE$(26);"2 - TRANSMISSION LINE MATH"
 25 PRINT SPACE$(26);"X - FINISHED USING"
 30 M$ = INKEY$
 31 IF M$ = "1" THEN 100
 32 IF M$ = "2" THEN 200
 33 IF M$ = "X" THEN SYSTEM
 49 GOTO 30
 50 DEF FNA(A) = INT (A*100+.5)/100
 51 DEF FNA(B) = INT (B*100+.5)/100
 52 DEF FNA(C) = INT (C*100+.5)/100
 53 DEF FNA(D) = INT (D*100+.5)/100
 54 DEF FNA(E) = INT (E*100+.5)/100
 55 DEF FNA(F) = INT (F*100+.5)/100
 56 DEF FNA(G) = INT (G*100+.5)/100
 60 DEF FNA(AA) = INT (AA*100+.5)/100
 61 DEF FNA(BB) = INT (BB*100+.5)/100
 62 DEF FNA(CC) = INT (CC*100+.5)/100
 63 DEF FNA(DD) = INT (DD*100+.5)/100
 70 RETURN
100 CLEAR : CLS
101 PRINT SPACE$(26);"ANTENNA DESIGN MATH"
102 PRINT SPACE$(20);"--------------------------------"
103 PRINT : PRINT : PRINT
104 INPUT "ENTER THE FREQUENCY";Z
105 IF Z <= 0 GOTO 10
110 CLS
111 PRINT SPACE$(26);"ANTENNA DESIGN MATH"
112 PRINT SPACE$(20);"--------------------------------"
113 PRINT : PRINT : PRINT
120 A = 994/Z
121 B = A*.75
122 C = A*.5
123 D = A*.25
124 E = A*.1
125 F = 234/Z
126 G = 240/Z
127 GOSUB 50
130 PRINT "DESIGN FREQ: "Z" MHZ --- DIMENSIONS IN FEET"
132 PRINT SPACE$(15);"FULL WAVE LENGTH IS: "FNA(A)
133 PRINT SPACE$(15);"3/4 WAVE LENGTH IS:  "FNA(B)
134 PRINT SPACE$(15);"1/2 WAVE LENGTH IS:  "FNA(C)
135 PRINT SPACE$(15);"1/4 WAVE LENGTH IS:  "FNA(D)
136 PRINT SPACE$(15);"1/10 WAVE LENGTH IS: "FNA(E)
137 PRINT SPACE$(15);"DIPOLE LEGS ARE:     "FNA(F)
138 PRINT SPACE$(15);"RADIALS ARE:         "FNA(G)
140 PRINT
141 PRINT "N - TRY AGAIN"
142 PRINT "M - MAIN MENU"
143 M$ = INKEY$
144 IF M$ = "N" THEN 100
145 IF M$ = "M" THEN 10
146 GOTO 143
200 CLEAR : CLS
201 PRINT SPACE$(24);"TRANSMISSION LINE MATH"
202 PRINT SPACE$(20);"--------------------------------"
203 PRINT : PRINT : PRINT
204 INPUT "ENTER THE FREQUENCY";Z
205 IF Z <= 0 THEN 10
210 CLS
211 PRINT SPACE$(24);"TRANSMISSION LINE MATH"
212 PRINT SPACE$(20);"--------------------------------"
220 Q = 248.5/Z
221 A = .75*Q : AA = 2*A
222 B = .66*Q : BB = 2*B
223 C = .8*Q : CC = 2*C
224 D = .79*Q : DD = 2*D
225 GOSUB 50
230 PRINT "DESIGN FREQ: "Z" MHZ --- DIMENSIONS IN FEET"
232 PRINT "1/4 WAVE"SPACE$(2);"RG8       "SPACE$(10);FNA(B)
233 PRINT SPACE$(10);"RG8A      "SPACE$(10);FNA(B)
234 PRINT SPACE$(10);"RG8 FOAM  "SPACE$(10);FNA(C)
235 PRINT SPACE$(10);"RG8X      "SPACE$(10);FNA(A)
236 PRINT SPACE$(10);"RG58      "SPACE$(10);FNA(B)
237 PRINT SPACE$(10);"RG58 FOAM "SPACE$(10);FNA(D)
238 PRINT SPACE$(10);"RG58 A/B/C"SPACE$(10);FNA(B)
239 PRINT SPACE$(10);"RG213     "SPACE$(10);FNA(B)
242 PRINT "1/2 WAVE"SPACE$(2);"RG8       "SPACE$(10);FNA(BB)
243 PRINT SPACE$(10);"RG8A      "SPACE$(10);FNA(BB)
244 PRINT SPACE$(10);"RG8 FOAM  "SPACE$(10);FNA(CC)
245 PRINT SPACE$(10);"RG8X      "SPACE$(10);FNA(AA)
246 PRINT SPACE$(10);"RG58      "SPACE$(10);FNA(BB)
247 PRINT SPACE$(10);"RG58 FOAM "SPACE$(10);FNA(DD)
248 PRINT SPACE$(10);"RG58 A/B/C"SPACE$(10);FNA(BB)
249 PRINT SPACE$(10);"RG213     "SPACE$(10);FNA(BB)
260 PRINT
261 PRINT "N - TRY AGAIN"
262 PRINT "M - MAIN MENU"
263 M$ = INKEY$
264 IF M$ = "N" THEN 200
265 IF M$ = "M" THEN 10
266 GOTO 263
```

Line Modifications for the C-64

The following commands must always be replaced as shown:

SPACE$(##); must be removed.
Example: 12 PRINT "MENU FOR THE XXXXXX HAM SYSTEM"

CLS replaced by PRINT "{shifted}CLEAR/HOME".

CLEAR replaced by CLR

M$ = INKEY$ replaced by GET M$: IF M$ = "" THEN (line number)
Example: 30 GET M$: IF M$ = "" THEN 30

replace the word DIMENSION with SIZE

Other modification lines are typed as they appear below:

```
 33 IF M$ = "X" THEN END
231 PRINT "1/4 WAVE"
232 PRINT "RG8       "FNA(B)
240 PRINT "PRESS ANY KEY FOR MORE" : GOSUB 290
241 PRINT "1/2 WAVE"
242 PRINT "RG8       "FNA(BB)
290 GET Z$ : IF Z$="" THEN 290
291 PRINT "{shifted CLEAR/HOME}" : RETURN
```

Continued from p. 22

for each line that is corrected. After all corrections have been made, SAVE the program as you originally did. However, give it a new name: HAM1A. Some computers will not accept programs of the same name on a single disk. Later, after you are satisfied that all is correct with the latest saved version, go back and erase the error-ridden versions. Then re-name the good version HAM1.

Well, that's all for now. Happy typing and running. More will follow next month. *[Ed. note: This month's listing, "HAM1," can be downloaded from the 73 BBS. Phone: (603) 525-4438 (73mag SIG).]* 73

You may reach Bill Clarke WA4BLC at RD#2 Box 455-A, Altamont NY 12009.

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Two QRP Transmitters

Dust the ethers and bend the waves!

by Charles D. Rakes KI5AZ

Here's two hot little CW QRP transmitters that you can build in an evening or two, then enjoy spanning the globe in milliwatt slippers for many moons and not be out much loot to boot.

The first and more complex of the two QRP transmitters is the 80 meter "Color Burst Ether Duster." It spurts out over 1 watt with full break-in operation. Two 7400 TTL ICs and four 2N3904 transistors control the electron flow.

The second and simplest transmitter is the 40 meter "Wave Bender" that operates with one IC and two transistors, to massage the antenna with about 500 to 750 milliwatts. This transmitter requires either a manual transmit-receive switch or a separate TX and RX antenna system.

Both circuits can be tailored to operate in either the 40 or 80 meter band by changing the crystal (XTAL) and output filter.

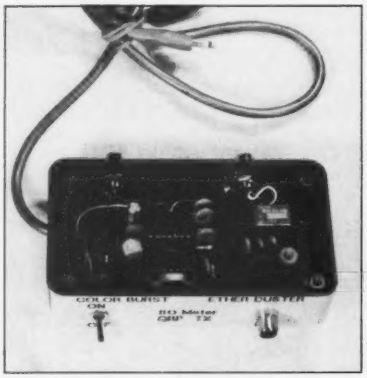

Photo A. The Color Burst Ether Duster.

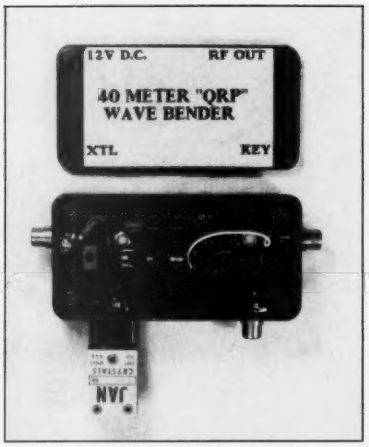

Photo B. The 40m Wave Bender.

Building the Ether Duster

Before starting construction, take a gander at the schematic diagram in Figure 1. Become acquainted with the circuit while your iron is heating up.

Short leads and neat wiring is a must if you choose to build your transmitter breadboard style. But if you take the easy path and use a PC board, construction will be a breeze. Just follow the component placement layout shown in the PC foil pattern drawing in figure 2 and stuff the parts in place. Take extra care in soldering in the two ICs so you don't end up building an unwanted solder bridge between pins.

The output filter coil, L1, is made by winding 24 turns of #26 copper enamel wire, evenly spaced on a T50-2 toroid core.

A Radio Shack deluxe plastic project case (RS 270-221) houses the transmitter in fine style. To duplicate this unit, just follow the general layout in the figure. RCA phono jacks are used for the key, antenna, and receiver connections. A mini-DPDT toggle switch turns the transmitter on, and a three-wire cable with mini-gator clips makes a handy battery connector.

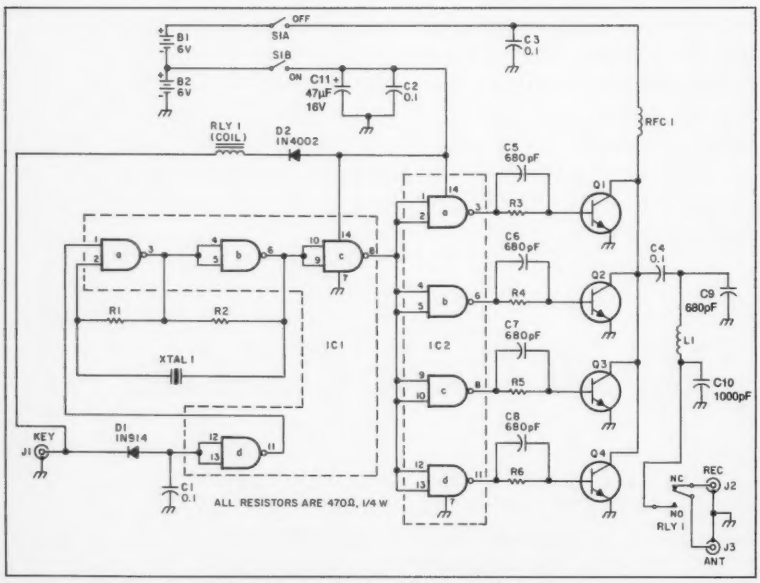

Figure 1. Schematic for the Color Burst Ether Duster.

Firing up the Ether Duster

Two 6-volt lantern batteries connected in series supply power to the circuit. The 6-volt junction between B1 and B2 supplies power to the two ICs. The full 12-volts power the four output transistors.

Connect a 50 ohm, 2 watt (two 100 ohm, 1 watt carbon resistors in parallel) load to the antenna jack and a current meter (500 mA range) in series with the +12 volt battery lead.

If you have an oscilloscope, monitor the RF output. Key the transmitter, and the current meter should read between 150 and 225 mA. A 20 to 30 volt peak-to-peak 3.579 MHz sine wave should then appear on the scope. A 20 volt peak-to-peak output translates into about 1 watt; a 25 volt signal is close to 1.5 watts; and a 30 volt output is about 2¼ watts.

Should you luck out and end up with a stubborn crystal that doesn't start each time the key is closed, just add a 15 to 25 pF capacitor between pin #6 of IC-1 and ground.

Full break-in operation occurs each time the key is closed, with the mini-relay operating in step with each dit and dah. The antenna is transferred from the receiver to the trans-

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COM-3 $279.00

2 WAY RADIO SERVICE MONITOR

COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantatic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features •Direct entry keyboard with programmable memory •Audio & transmitter frequency counter •LED bar graph frequency/error deviation display •0.1–10.000 µV output levels •High receive sensitivity, less than 5 µV •100 kHz to 999.9995 MHz •Continuous frequency coverage •Transmit protection, up to 100 watts •CTS tone encoder, 1 kHz and external modulation.

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SYNTHESIZED SIGNAL GENERATOR

Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features •100 kHz to 999 MHz •100 Hz resolution to 500 MHz, 200 Hz above • – 130 to + 10 dBm output range •0.1 dB output resolution •AM and FM modulation •20 programmable memories •Output selection in volts, dB, dBm with instant conversion between units •RF output reverse power protected •LED display of all parameters—no analog guesswork!

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Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one-year warranty on parts and labor. We take great pride in being the largest manufacturer of low-cost counters in the entire U.S.A. Compare specifications. Our counters are full-featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry, and durable high quality epoxy glass plated-thru PC board construction. All units are 100% manufactured in the U.S.A. All counters feature 1.0 ppm accuracy.

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Telescopic whip antenna—BNC plug, WA-10	$11.95
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Tilt bail, elevates counter for easy viewing, TB-70	$9.95
Rechargeable internal battery pack, BP-4	$9.95
CT-90 oven timebase, 0.1 ppm accuracy, OV-1	59.95

ALL COUNTERS ARE FULLY WIRED & TESTED

MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
CT-50	20 Hz–600 MHz	< 25 mV to 500 MHz	8	1 Hz, 10 Hz	$189.95
CT-70	20 Hz–550 MHz	< 50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	< 10 mV to 150 MHz < 150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	< 25mV to 50 MHz < 15 mV to 500 MHz < 100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	< 25 mV to 50 MHz < 10 mV to 1 GHz < 50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$239.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	< 50 mV	Convert your existing counter to 1.5 GHz		$89.95

SPEED RADAR $89.95 complete kit SG-7

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes delivery. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

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Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.

PR-2, wired, includes AC adapter $59.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.

PA-1, 40W pwr amp kit $29.95
TR-1, RF sensed T-R relay kit . $ 8.95

FM WIRELESS MIKE KITS

FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88–108 MHz FM band up to 300' except for hi power FM-4 that goes up to ½ mile.

FM-1, basic unit ..... $ 5.95
FM-2, as above but with added mike preamp ..... $ 7.95
FM-4, long range, high power with very sensitive audio section, picks up voices 10' away $14.95
FM-3, complete unit includes case, battery, switch, antenna, and built-in condensor mike. Excellent fidelity, very small, kit $16.95
FM-3WT, as above, but fully wired and tested $19.95
SMC, miniature sensitive mike cartridge for FM-1, 2, 4 ..... $ 2.95

MICROWAVE INTRUSION ALARM
A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC.
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Complete kit, MM-5 . $24.95
Case + knob set, CMM-5 . $12.95

PACKET RADIO
Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software. PC board, all necessary parts and full documentation.
Complete kit, PC-1 . . . . $49.95

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Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!
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JM-7 . . . . . $14.95

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ML-1 kit. $8.95

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SA-7 kit $14.95

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FTR-146 kit $129.95
FTR-148-C aluminum case & knob set $24.95

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Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.

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Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.

CW-7 kit $24.95
Matching case knob set, CCW $12.95

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AA-7 Kit $24.95
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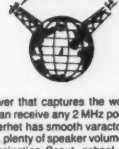
Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.

SS-7 kit $29.95
Matching case & knob set, CSS $12.95

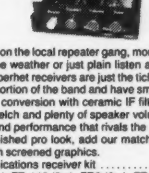
SHORTWAVE RECEIVER



Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4–11 MHz. True superhet has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3–22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!

Shortwave receiver kit, SRI $27.95
Shortwave converter kit, SCI $24.95
Matching case set for SRI, CSR $12.95
Matching case set for SCI,CSC $12.95

2, 6, 10 MTR, 220 FM RECEIVERS

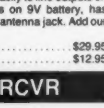


Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.

FM communications receiver kit $29.95
Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)
Matching case & knob set, CFR $12.95

FM STEREO TRANSMITTER

STEREO



Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!

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CIRCLE 34 ON READER SERVICE CARD

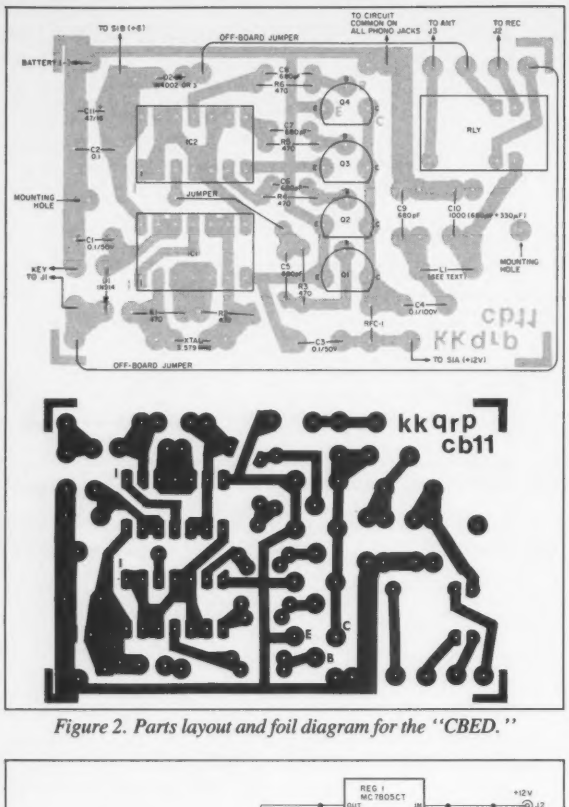

Figure 2. Parts layout and foil diagram for the "CBED."

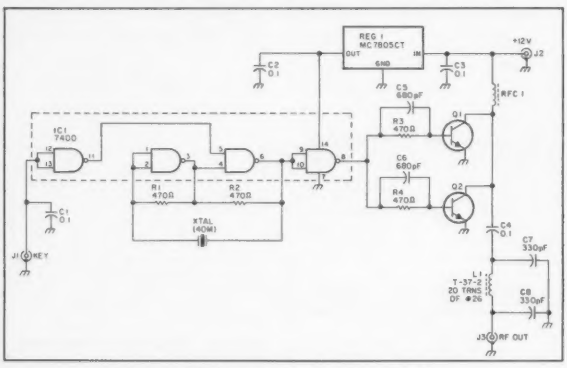

Figure 3. Schematic for the Wave Bender.

mitter's output with each key closure and back, to receive in the key-up position.

The Color Burst Frequency

You might wonder why anyone would want to operate a QRP transmitter on a frequency that every color TV set in the country generates. Good question. Well, first, it's a legal 80 meter frequency, and second, there is an unlimited supply of cheap-to-free 3.579 MHz crystals from secondhand and junk color TVs. And if you monitor the frequency for a while, you'll hear a lot of CW activity, including a couple of nets. It's another challenge for the QRPer! I'll be looking for you on the Color Burst frequency.

The 40m Wave Bender

The Wave Bender transmitter is about twice as easy to build, especially if you use a PC board. Just follow the layout in the figure and solder each component in place.

The output filter coil, L1, is made by winding 20 turns of #26 copper enamel wire evenly spaced on a T37-2 toroid core.

The completed circuit board fits snugly inside Radio Shack's deluxe plastic project case (RS 270-220). The battery input, the key, and the RF output connections are all made through RCA phono jacks mounted to the enclosure.

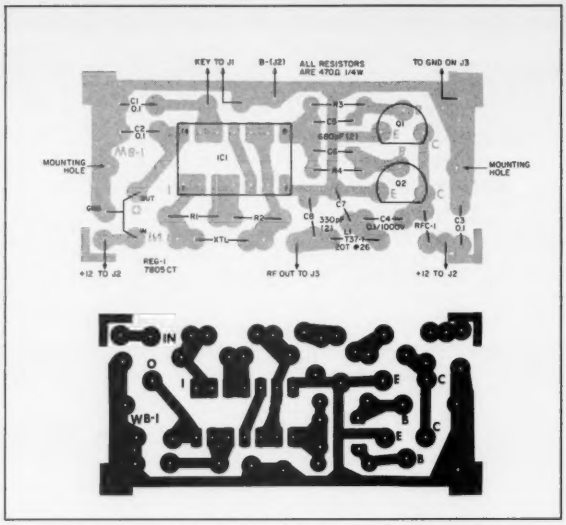

Figure 4. Parts layout and foil diagram for the "WB."

Table 1. The Color Burst Ether Duster

B1,B2	6-volt lantern battery	
C1-C3	0.1 µF/50-volt	disc ceramic cap
C4	0.1 µF/100 volt	disc ceramic cap
C5-C9	680 pF/100-volt	disc ceramic cap
C10	1000 pF/100-volt	(680 pF + 330 pF)
C11	47 µF/16-volt	electrolytic cap
D1	1N914	silicon diode
D2	1N4002 or 1N4003	silicon diode
IC-1,IC-2	7400 TTL	
Q1-Q4	2N3904	NPN transistor
R1-R6	470 ohm	¼ watt resistor
RFC	22 µH	choke
L1	24 turns #26 wire	T50-2 core, see test
Relay-1	5 volt relay	RS 275-243 or Mouser #ME431-1205
S1	mini-DPDT	toggle switch
XTAL	3.579 MHz	color burst crystal

Misc.: Cabinet Radio Shack #270-221, phono jacks and plugs, wire solder, circuit board, etc.

You can get a kit of parts for the Color Burst Ether Duster, including the circuit board, for $19.95 postpaid, from Krystal Kits, PO BOX 445, Bentonville AR 72712, or call (501) 273-5340 and ask for KI5AZ. You will have to furnish the enclosure, S1, J1-J3, to complete your TX. A PC board only is also available for $6.25.

Table 2. The Wave Bender

C1-C3	0.1 µF/50-volt	disc ceramic cap
C4	0.1 µF/100-volt	disc ceramic cap
C5,C6	680 pF/100-volt	disc ceramic cap
C7,C8	330 pF/50-volt	disc ceramic cap
IC-1	7400 TTL	disc ceramic cap
Q1,Q2	2N3904	NPN transistor
Reg.-1	7805CT	5-volt regulator IC
J1-J3	RCA	phono jacks
R1-R4	470 ohm	¼-watt resistor
RFC-1	10 µH	choke
L1	20 turns of #26 wire	on T37-2 core
XTAL	Any 40M crystal	

Misc. Radio Shack plastic cabinet, RS 270-220; wire, solder, circuit board, batteries, etc.

You can get the 40 meter Wave Bender, including the circuit board, in kit form from the author at Krystal Kits for $14.95 postpaid. You will have to furnish the enclosure, jacks, crystal, and socket to complete your transmitter. A PC board only is $5.25. See Table 1 for the address.

The XTAL socket is also mounted in a similar fashion.

Plug in a good 40 meter crystal, and connect a 50 ohm, 2-watt load to the RF output. Connect a milliampere meter (0 to 500 mA) in series with battery positive, and close the key. If you're not in cahoots with Murphy, the current meter should read between 125 and 160 mA on key-down, and about 25 mA on idle. The RF across the 50 ohm load should be between 15 and 20 volts peak-to-peak, for an output of 500 milliwatts to slightly less than 1 watt.

The 40 meter Wave Bender is basically the Color Burst circuit cut in half. See Figure 3, the circuit diagram. All you need are two transistors and one IC. There's no provision for break-in operation. Just about any fundamental-cut crystal will oscillate in the circuit; the readily available and inexpensive FT-243 type of crystal was my choice.

A 7805CT 5 volt regulator simplifies the battery hook-up, which also allows the circuit to operate with an input of 8 to 12 volts. By changing the supply voltage, the RF output can be set for a special QRP power output level.

Now for the real fun—making that very first contact with your very own home-built QRP transmitter. Good luck, and 73s from KI5AZ down in the Ozarks and back in the hills. 73

Charles D. Rakes KI5AZ, PO Box 445, Bentonville AR 72712.

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Astron	CES	Mirage/KLM	Unadilla/Reyco
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A Better Tube Tester

Check more than just DC amplification.

by John Shelley WA1IAO

Even in these days of increasingly sophisticated solid state equipment, many hams still buy and use tube-type equipment. There's a lot of perfectly usable old gear at hamfests you can pick up. Still, you need to be able to check it.

Most hams use GM (transconductance) tube checkers in their shacks. I cringe when I see someone buying a military or commercial checker at a flea market, because I have gotten very few accurate readings from them in my thirty-odd years of using them.

How could these boxes with all their switches, knobs, and meters not solve the mysteries of the glowing bottles? Simply put, most checkers were designed to test the tubes as if the tubes were DC amplifiers, and there is too much cumulative error built into them. The worst part is that they lack a sensitive leakage test.

Checking Tubes

I watched military tubes deteriorate. Commercial tubes soon followed. For instance, Western Electric made quality tubes for their Nike missile system, but other manufacturers soon outbid them, with disastrous results. At one time in the sixties, Congress tried to withhold funding for military systems because their inspections had shown that the average time between failures was six hours. The resulting hue and cry, along with promises of great breakthroughs, was sufficient to push the budget through, however. The problem lay in there not being a valid test for tubes.

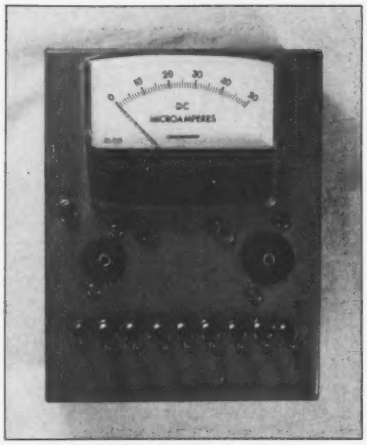


Photo A. The completed tube tester.

A Tektronix field engineer once held a seminar at our shop to help us learn how to fully use their instruments. Ours was the first facility at which he found all circuits properly calibrated and operating. The calibration of a 545 scope, for instance, is a cumulative process. Every step depends on obtaining the proper adjustment and using quality parts in its construction. The probability of their changing value or tuning by themselves is practically nil. The many tubes involved, however, can cause profound changes due to contaminants.

It was awful seeing technicians chasing contaminants and repeatedly adjusting pots, hoping that the reading would suddenly pop into specs. It drove some to despair: A Hawaiian National Guard Technician reportedly tried to charm a defective radar scope into operation by chanting and shaking a tea leaf at it!

To many, the 10-channel AN/GRC-27 was a monster. But once tuned with clean tubes, they were easily managed by periodically purging them of leaks—little or no retuning required!

The worst example of equipment failure I ever found was in the ACV/TVM model ME-6c/U. Its amplifier tubes were 6BH6s, and I never found a good one in JAN (military) stock. The meters were totally useless because, with those tubes, they would do nothing but oscillate or freeze against the pins.

Finding Leaks

My tube checker uses high sensitivity to look for leakage. It is small, easy to build, and it finds bad tubes ranging from audio amplifiers to UHF oscillators. Using a voltage near B+ potential, the tester tries to read it through the (presumably) empty spaces between elements. (Note: The large, octal, transmitting-type tubes are not included in this discussion; they are better tested in-service.)

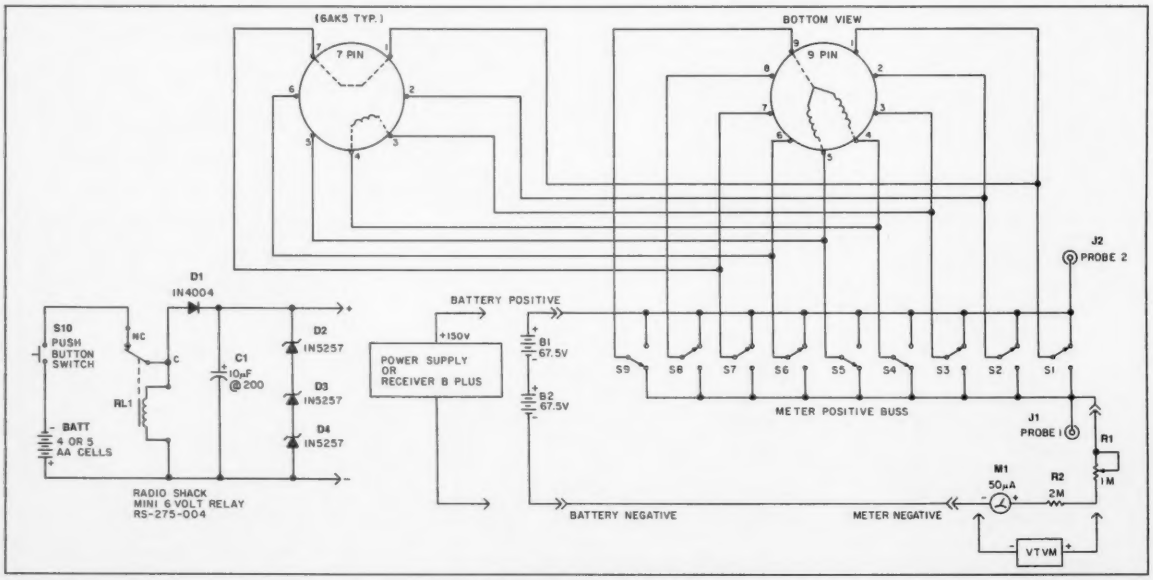


Figure 1. Schematic diagram of the tester.

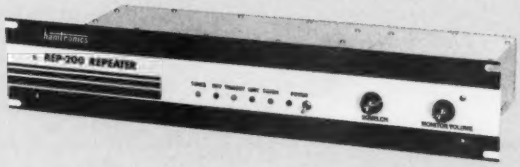
If you always thought a microprocessor-controlled repeater had to be expensive, LOOK AGAIN! You could easily spend this much just for a controller.

REP-200 REPEATER

A premium repeater with autopatch and many versatile dtmf control features at *less than many charge for a bare-bones repeater!*

We don't skimp on rf modules, either! Check the features on R144 Receiver, for instance: GaAs FET front-end, helical resonators, sharp crystal filters, hysteresis squelch.

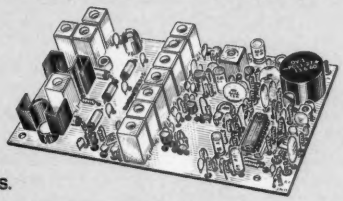
Kit $1095; w/t only $1295!



- Available for the 2M, 220MHz, 440MHz, 902MHz bands. ***FCC type accepted*** *(vhf and uhf commercial bands).*
- **Rugged exciter and PA,** designed for continuous duty.
- Power output 15-18W (25W option) on 2M or hi-band; 15W on 220MHz; 10W on uhf or 902MHz.
- Accessory add-on PA's available with **power levels up to 100W.**
- **Six courtesy beep types,** including two pleasant, sequential, multi-tone bursts.
- **AUTOPATCH:** either **open or closed** access, **toll-call restrict,** auto-disconnect.
- **Reverse Autopatch,** two types: auto-answer or ring tone on the air.
- **DTMF CONTROL:** over 45 functions can be controlled by touch-tone. Separate 4-digit control code for each function, plus extra **4-digit owner password.**
- **Owner can inhibit** autopatch or repeater, enable either open- or closed-access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options, including two auxiliary external circuits.
- The cwid message, dtmf command codes, and owner-specified default parameters for cor and cwid timers and tones are burned into the eprom at the factory.
- Cw speed and tone, courtesy beep and tail timers, and courtesy beep type **can all be changed at any time** by owner-password-protected dtmf commands.
- Many **built-in diagnostic** & testing functions using microprocessor.
- Color coded led's **indicate status** of all major functions.
- **Welded partitions** for exciter, pa, receiver, and controller. PEM nuts hold covers.
- 3-1/2 inch aluminum rack panel, finished in eggshell white and black.
- **Auxiliary receiver input** for independent control or **cross linking repeaters.**

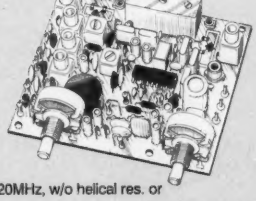
REP-200V Economy Repeater Kit. As above, except uses COR-4 Controller without DTMF control or autopatch. **Kit only $795.**

HIGH PERFORMANCE XMTRS & RCVRS FOR REPEATERS, AF & DIGITAL LINKS, TELEMETRY, ETC.



FM EXCITERS: kits $99, w/t $169. 2W continuous duty. TCXO & xtal oven options available. *FCC type accepted for com'l uhf & hi bands.*

- **TA51** for 2M, 150-174, 220MHz.
- **TA451** for uhf.
- **TA901** for 902-928MHz, (0.5W out; w/t only).
- **VHF & UHF AMPLIFIERS.** For fm, ssb, atv. Output from 10W to 100W. Several models, kits starting at $79.

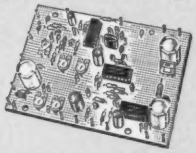


FM RECEIVERS: kits $139, w/t $189.

- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift.
- **R451 UHF FM RCVR,** similar to above
- **R901 902-928MHz FM RCVR.** Triple-conversion, GaAs FET front end.
- **R76 ECONOMY FM RCVR** for 6M, 2M, 220MHz, w/o helical res. or afc. Kits $129.
- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Kit $129, w/t $189.

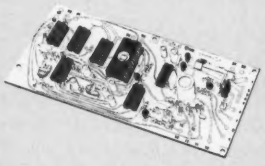
ACCESSORIES

TD-3 SUBAUDIBLE TONE DECODER/ENCODER kit. Adjustable for any tone. Designed **especially for repeaters,** with remote control activate/deactivate provisions $24

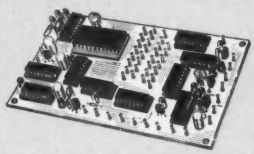


COR-3 REPEATER CONTROLLER kit. Features adjustable tail & time-out timers, solid-state relay, courtesy beep, and local speaker amplifier $49

CWID kit. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 .....$59



COR-4 kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call $99



TD-2 TOUCH-TONE DECODER/CONTROLLER kit. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! $79

AP-3 AUTOPATCH kit. Use with above for repeater autopatch. Reverse patch & phone line remote control are std .$79

AP-2 SIMPLEX AUTOPATCH Timing Board kit. Use with above for simplex operation using a transceiver $39

MO-202 FSK DATA MODULATOR kit. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. $39

DE-202 FSK DEMODULATOR kit. For receive end of link. $39

9600 BAUD DIGITAL RF LINKS. Low-cost packet networking system, consisting of new MO-96 Modem and special versions of our 220 or 450 mHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W.

GaAs FET PREAMPS

at a fraction of the cost of comparable units!

LNG-(*)

ONLY **$59** wired/tested

FEATURES:

- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
- **Wide dynamic range** - resist overload
- **Stable:** low-feedback dual-gate FET

**Specify tuning range: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.*

LNW-(*) MINIATURE GaAs FET PREAMP

ONLY **$24**/kit, **$39** wired/tested

- GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, or 400-500 MHz.*

LNS-(*) IN-LINE PREAMP

ONLY **$79**/kit, **$99** wired/tested

- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

**Specify tuning range: 120-175, 200-240, or 400-500 MHz.*

HELICAL RESONATOR PREAMPS

Preamps with 3 or 4 section helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRG-(*), $49 vhf, $94 uhf.**

**Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-450, 450-470.*

RECEIVING CONVERTERS

Low noise converters to **receive vhf and uhf bands on a 10M receiver.** Choice of kit with case & BNC jacks, kit with pcb only, or w/t unit in a case. *Request catalog for complete listings.*

VHF Input ranges avail: 136-138, 144-146, 145-147, 146-148; kit less case $39, kit w/case $59, w/t in case $69.

UHF Input ranges avail: 432-434, 435-437, 435.5-437.5; kit less case $49, kit w/case $69, w/t in case $99.

TRANSMITTING CONVERTERS

XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 2M, 432, 435, and for atv. 1W output. **Kit only $79.** PA's up to 45W available. *Request catalog for complete listings.*

- For complete info, call or write for FREE 40-page catalog.
  Send $2 for overseas air mail. For casual interest, check reader service; allow 3-4 weeks.
- Order by mail, fax, or phone (9-12, 1-5 eastern time)
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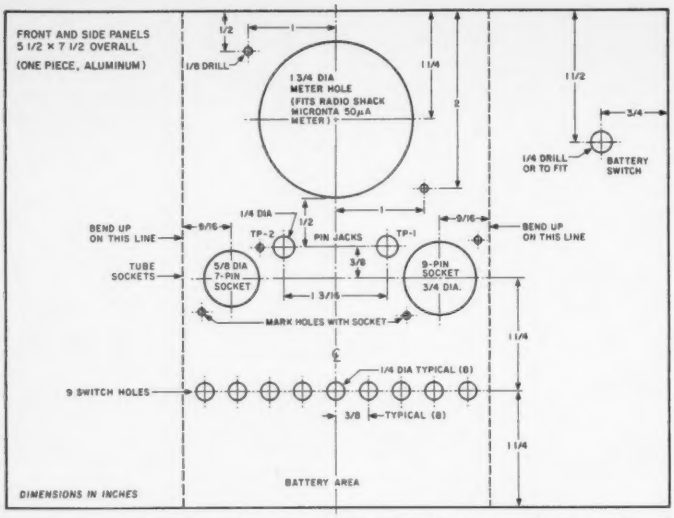

Figure 2. Front panel drilling template. Note that the Radio Shack meter has been discontinued. Use dimensions to fit your particular meter.

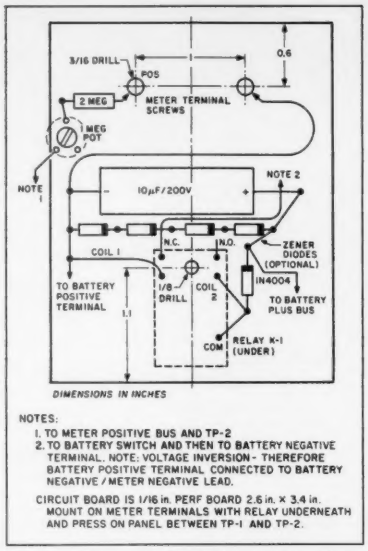

Figure 3. Internal circuit board parts placement. All parts mounted on perfboard. (Note the optional parts if using Option A on Figure 1).

By accident, I discovered how leaks cause malfunctions. There was a walkie-talkie battery on my workbench, with a set of test leads attached to the 135 volt terminals. We used it to test electrolytic capacitors at near-working voltages. At one time, it detected a group of leaky, screen-bypass capacitors which had prevented us from obtaining proper sensitivity figures in a series of receivers we had to maintain.

One day I was checking out a receiver someone had brought in after unsuccessful attempts to stop it from buzzing. He checked the filters and tubes, to no avail. With the small amount of knowledge I had then, I attacked the problem. Hoping to find a motorboating capacitor, I isolated the B+ lead from the power supply and attached a VTVM in series with the battery, and the B+ path to ground. There was a leak! Why, though, was it not oscillating?

Next, I removed the tubes to prevent breakage while I unsoldered the capacitors. Lo and behold, the leak disappeared when I removed the first tube. Sure enough, there was a leak between the filament pins and one of the grids of the mixer tube. Apparently the 60 Hz from the filament was modulating the local oscillator, and sending the products down through the IF and audio circuits.

As time went on, I found leaks in many tubes, bridging all possible combinations of elements. I soon found it necessary to build a switch box containing a battery and sockets, to eliminate the hassle of manipulating the tubes and test leads in my hands. This became the mainstay of our Signal Corps repair shop, and later, the Ordnance missile radar shop. We practically eliminated troubleshooting, except for shorted electrolytics and obviously broken or burned parts.

Construction

If you own some pieces of tube equipment, you should at least build a portable checker. In its simplest form, it uses a 50 μA meter movement instead of a VTVM. This provides reasonable sensitivity, and will fit into a hand-held box. You can take it to flea markets and save yourself from disappointment by testing tubes before you buy them.

See Figure 1. The dotted filament on the 9-pin diagram shows the most common arrangement of a 9-pin tube. S-4, S-5, and S-9 are shown down, to allow you to check leaks from the filament to all other pins. Similarly treat the most common 7-pin tubes by pushing down S-3 and S-4 simultaneously. Multiple pins for any element should be switched together. Otherwise, the common connections will short. The control grid of a 6AK5, for instance, has connections to both pins 1 and 7. Actuate all other switches singularly to look for leakage paths. When a switch is down, lightly tap the tubes to bring out indications that may may be temporarily hidden. Then, return the pin to the up position before going on to the next one. Pin jacks TP-1 and TP-2 are used to check tubes that have nonstandard bases, using test leads.

I suggest that the panel, at least, of the box be made of metal and connected to the battery's negative terminal.

A tester can also use the leads to find leaks in capacitors and even in wiring. Once I found a leak that had confounded technicians. They were searching for whatever had caused a circuit to overload a power supply, and they had found nothing with an ohmmeter except the 135 volt feed wire to the circuit. Probing the wiring, however, caused variations in the meter reading. I found a charred area hidden where the insulation of a wire came in contact with a metal part. It seems that a nearby lightning strike had arced through and disabled an entire radar system. It is unfortunate that we cannot use a high potential on modern, low-voltage circuitry, to find breakdowns such as these.

Parts List

S1–S9	SPDT toggle switches
J1,J2	Test jacks
R1	1MEG potentiometer
R2	2MEG resistor
M1	50 μA panel meter
Power supply	
—Option A:	
S10	Momentary contact switch
RL1	6 volt relay (RS# 275-004)
D1	1N4004 diode
D2,D3,D4	1N5257 zener diode, 33 volts at ½W
C1	10 μF/200 volt electrolytic capacitor
—Option B:	
Any 90 to 150 volt DC supply	
—Option C:	
B1,B2	67.5 volt batteries in series (Eveready #416, Newark Electronics #49F1009)

Points To Remember

Some important points are in order. One is that sunlight causes conduction in some tubes, and they should be shaded during testing. Another is that they should be clean, especially between the pins. Holding them in perspiring hands just before testing them will show leaks, as will not letting them cool off for at least two minutes after operation. Each switching operation causes a capacitive kick on the meter, and each user will have to decide on a tolerable residual reading for his particular setup.

Also, if solder flux other than rosin is used to build the tester, all socket pins will show leakage—permanently. Surprisingly, some leakage paths show diode characteristics, so a thorough test would require starting with all switches down and sequencing them upward in addition to the initial test.

In spite of their high-power consumption, tubes are one of the greatest inventions in history. When not contaminated, they give many years of reliable service. 73

high-quality **low-cost**

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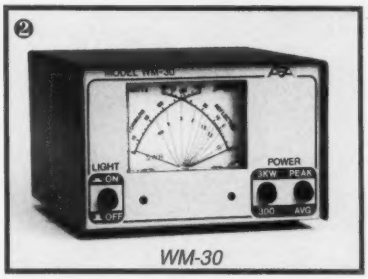
Exlusively for AEA

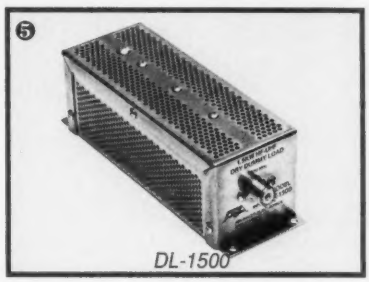
QT-1



WM-30

ET-1

LPF-30



DL-1500

① QT-1 Antenna Tuner: *1.8 - 30 MHz; built-in dummy load; illuminated cross-needle SWR & power meter; 30 or 300 W range; peak or average; matches virtually any receiver, transmitter or transceiver from 1.8 to 30 MHz with almost any antenna; versatile input/output selections allow tuned or direct dummy load, coax 1, coax 2, balanced line and end-fed wire $159.95*

② WM-30 Power/SWR Meter: *true shielded directional coupler; illuminated cross-needle meter measures forward and reverse power and SWR simultaneously; peak or average; 300 or 3000 watt range; 160-10 meters; 6"D x 5-1/4"W x 3-1/2"H, 1-1/4 lbs $99.95*

③ ET-1 Antenna Tuner: *1.8 - 30 MHz; 30 or 300 W; cross-needle SWR & power meter; compatible with almost ANY real antenna including verticals, dipoles, inverted vees, beams and mobile whips that are fed by coax cable, balanced lines or a single wire; built-in 1:4 balun; 9-3/8"D x 10-1/4"W x 3-1/2"H; weighs 3-1/2 lbs $129.95*

④ LPF-30 Low Pass Filter: *suppresses TVI at the source; reduces TVI radiated by transmitters operating below 30 MHz; additional attenuation to TV IF frequencies above 40 MHz; nine-pole inverse Chebyshev filter design; -60 dB or better, depending on freq.; insertion loss 0.5 dB in passband; handles up to 1500 watts; 8-5/8"D x 2-7/8"W x 2-3/4"H, 1 lb. $49.95*

⑤ DL-1500 Dry Dummy Load: *1500 W (10 sec); 100 W continuous; DC to 650 MHz; VSWR 1.3:1 simulates matched 50 ohm antenna to test your transmitter; compact (8-5/8"D x 2-7/8"W x 2-3/4"H) and lightweight (2 lbs.) . . . 69.95*

The above products all feature alodined aluminum cases for eye-pleasing protection against scratches and corrosion.

Prices listed are suggested Amateur Net through participating AEA authorized dealers. Specifications are subject to change without notice or obligation.For more information, contact AEA at (206) 775-7373.

Technical support may be obtained through Compuserve's Hamnet forum. Messages should be sent to user ID #76702,1013.

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73 Review *by Peter Ferrand WB2QLL*

The JPS NIR-10

Separate the words from the noise.

JPS Communications, Inc.
P.O. Box 97757
5516 Old Wake Forest Road
Raleigh NC 27609
Tech Info: (919) 790–1048
Orders: (800) 533–3819
Price Class: NIR-10, $395;
AC Adapter, $12, including shipping.

"All you ever do is listen to noise!" Is that how people have described your hobby? Now, thanks to state-of-the-art digital signal processing, you don't have to listen to that complaint—or to most of the noise—anymore.

The JPS NIR-10 Noise/Interference Reduction Unit is the first unit on the ham market to identify what human speech sounds like, then separate it from most of the other stuff on the band: ignition and power line noise, computer noise, heterodynes, and even the white noise generated by atmospheric conditions and within the receiver. It won't make listening to 75 meter sideband sound like your local FM broadcast station, but under reasonable conditions the constant racket under single sideband voice signals will hardly be noticeable anymore. If you've been hearing that same noise for more than 30 years, as I have, you may not even think about it, but noise is fatiguing. It has left me with a ringing in the ears—even after an interesting QSO.

The NIR-10 won't take a signal that's down in the noise and magically bring it out into the clear (one of my fondest dreams). Its biggest improvement is on signals at least one-half to one S-unit above the noise, where there's enough speech information to extract. Take a quick look at the before and after oscilloscope plots in Figures 1 and 2. In each, the top trace is the noisy HF sideband signal from the receiver; the bottom trace shows the audio output of the NIR-10, cleaned up and slightly delayed.

The NIR-10 is wired up between your receiver's speaker output and its speaker, just like a standard audio filter, although JPS doesn't want you to think of the unit as a filter in the normal sense of the word. Actually, the NIR-10 has two modes: the NIR mode which separates the speech sounds from the noise, and a bandpass mode which acts as a very selective filter.

The bandpass mode is intended primarily for nonvoice modes, and provides a choice of three bandwidths and a variable center frequency. Since digital signal processing (DSP) is used for the bandpass filter, the sides of the filter's slope are very nearly straight when plotted on a graph showing bandwidth versus amplitude. Ultimate selectivity is achieved at just slightly beyond the three bandwidths of 200, 600, and 1,500 Hz.

The bandpass mode performs well and is sharper than the analog or switched-capacitor designs I've used, but most of this review concerns the NIR mode, since that's what really makes the product unique.

Getting Started

The NIR-10 is a small black box, 2″ x 7″ x 6″ (HWD) that will sit discretely atop your rig. This is probably the best spot for it, since you will be frequently manipulating the controls.

Hookup couldn't be easier: Audio from the receiver goes into the input jack, and your station speaker goes to the NIR-10 output jack. All that remains is to feed in power from the optional wall transformer or your regular station supply, 11 to 15 volts DC at 1 amp peak. Then you turn the receiver volume control up to the point where the NIR-10 "peak" indicator begins to flash on voice peaks, and from then on use the NIR-10's volume control to adjust the speaker level.

A toggle switch moves the NIR-10 between bypass, bandpass, and NIR modes. When in NIR mode, a rotary control also adjusts the level of interference reduction; the same control adjusts the device's center frequency when in bandpass mode. The rest of the front panel includes a three-position bandwidth switch for the bandpass mode, a headphone jack, and the on/off switch.

The World of Noise

The big problem with noise reduction is that there's an infinite variety of different types of noise. Any noise reduction scheme must represent the designer's best guess on what the difference is between the noise and the desired signal. You've probably noticed how the noise blanker on one rig works better on particular types of noise, and a different rig can best eliminate a different sort of noise.

As the NIR-10 tries to separate noise from speech sounds, it runs into the basic limitation that speech corrupted by noise doesn't sound much like speech anymore. So if there's not much difference between the noise and the signal, there's not much it can do, and removing the noise leaves you without an intelligible signal. Depending upon the specific noise, the NIR-10 will produce its most impressive noise reduction when the desired signal is about one S-unit stronger than the average noise level. JPS specifies that the NIR-10 is capable of up to 20 dB of white noise reduction, and 40 dB of tone elimination. Keep in mind, though, that the inherent limitation of the NIR-10 is that the stronger the signal, the more noise it will eliminate.

The NIR-10 does a superb job on ignition interference, where cutting down the typically high noise level makes for far easier listening. While the NIR-10 will reduce tones and heterodynes, it won't get them all the way down, as a notch filter will. Keep in mind, however, that a notch filter will only handle one tone, while the NIR-10 will reduce all the tones it finds.

On the other hand, since adjacent channel splatter from other stations is a form of speech, the NIR-10 won't reduce them at all; its NIR mode does not reduce bandwidth beyond the 3.2 kHz it normally passes. So, a notch filter and a conventional bandpass filter are still useful. I find they work better if they act on the signal before it gets to the NIR-10. A noise limiter is still useful, since some types of static crashes are too fast for the device to respond to.

The NIR-10 works on speech, so it will work fine with AM, FM, and SSB, but music is pretty badly chopped up. You can still generally hear the speech component of music, and that's useful if you're trying to ID a broadcaster.

Note that the action of the digital processing produces a delay between the input and the output signals of about 130 milliseconds. This isn't normally a major problem, and you'll quickly get used to a backlash-type effect as you tune around. It does, however, make the unit unsuitable for fast turnaround modes, such as two-way AMTOR.

Seeing the Effect

To illustrate the effect and create Figures 1 and 2, I used a LeCroy 9410 digital oscilloscope. I tuned the receiver to a sideband station, and displayed amplitude in the vertical axis and time in the horizontal, using a plotter to create a printout. The top trace shows the

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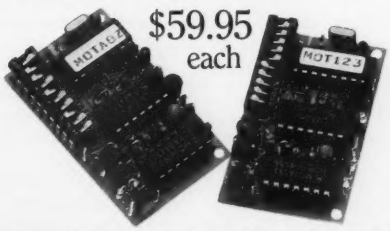

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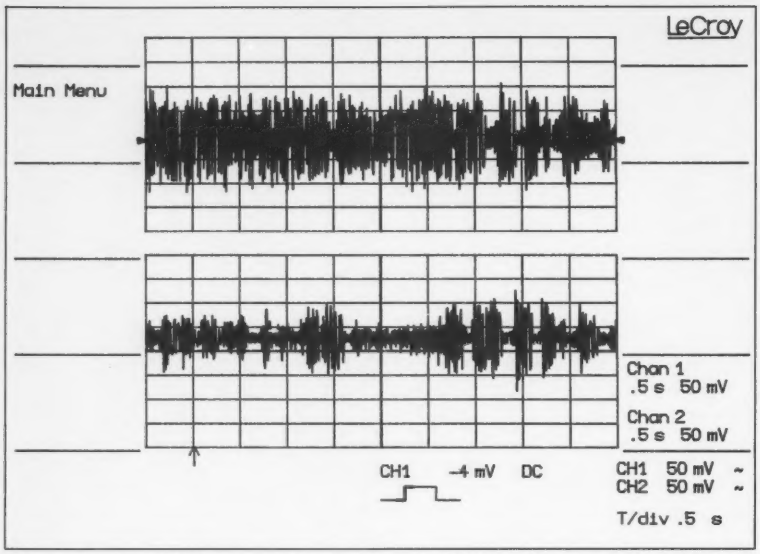

Figure 1. A 20 meter sideband signal partially covered with power line noise. Note the difference between the top trace, the input to the NIR-10, and the bottom trace, showing the cleaned-up output.

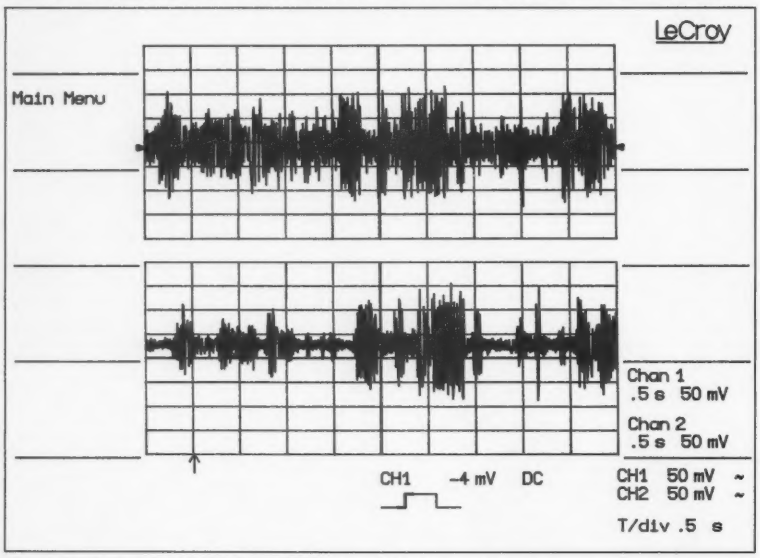

Figure 2. A 40 meter sideband signal during the midday (top trace). The bottom trace shows the results after processing by the NIR-10. The increased dynamic range between the signal and noise is quite obvious.

All scope traces taken with a LeCroy 9410 digital oscilloscope contributed by John Seney WD1V.

audio input to the NIR-10; the bottom the output.

Figure 1 shows a 20 meter signal with a severe local power line noise, mostly in the first half of the trace. The NIR-10 had no trouble eliminating it, leaving something close to a normal speech pattern.

Figure 2 shows a 40 meter midday QSO with more random atmospherics. You can easily see the speech waveforms and their amplitudes preserved, while the noise between the speech bursts is greatly reduced. You can also clearly see the offset between the input and output traces, showing the unit's internal delay.

What the plots don't show is the effect of adjusting the NIR level control. A signal close to the noise level would allow only a small amount of noise reduction, perhaps in the 9 o'clock position of the control, before it becomes too choppy to be intelligible. As the signal becomes stronger, you can turn up the control for more noise reduction, with most signals optimized with the NIR control at about 12 o'clock.

As the noise reduction takes place, you'll notice that the remaining noise sounds a lot different than you're used to, primarily because it has been "de-randomized" into low-level, very short-duration tones described as "beedely-beeps." It's not annoying, just different.

CW operation is improved in the NIR mode, too, except for slow CW, which the device will try to attenuate. By greatly reducing the noise, copy via a computer system such as a multimode TNC produces a lot fewer errors.

Operating Notes

JPS has cleverly provided the capability to switch the NIR-10 into bypass mode electronically, in addition to using the front panel switch. Thus, you can connect the "remote bypass" to the push-to-talk line of your rig and monitor your transmissions without the delay.

The NIR-10 can also be used for transmitting, providing a more effective method of communicating in a high-noise environment than a noise-canceling microphone. You'll have to work up your own switching scheme if you want to use the same unit for both transmitting and receiving.

JPS provides a concise but complete manual, describing both the hookups and the philosophy of the NIR-10's design and operation. This approach is especially valuable because the NIR-10 represents a new category of equipment on the market. A partial schematic is included for troubleshooting the simpler parts of the set; a block diagram illustrates the actual DSP logic.

Even in bypass mode, the NIR-10 still works as an amplifier and the volume control is in the circuit, meaning it has to be powered up in order to hear anything fed to it. It's a minor quibble, but I find setup and troubleshooting simpler when things are completely out of the circuit when bypassed.

All digital devices tend to create noise of their own, and the NIR-10 under test did produce some digital noise on a nearby broadcast radio, although there was no noise detectable on my ham equipment when attached to an external antenna. JPS says improvements in shielding and filtering have greatly reduced this effect in current production units.

Physically, the NIR-10's workmanship is excellent and shows evidence of the JPS commercial equipment line, from which it's been adapted.

It's Worth Having

We're going to be seeing a lot more of digital signal processing in our communications equipment, and it's fun to think about a future where we can sit at a keyboard and optimize all possible signal conditioning parameters to combat any interference. On the other hand, I have a half dozen audio filters and sometimes I think all they do is provide knobs to turn when there's no signal to hear.

At no time was there ever a signal I could copy with the NIR-10 that was unintelligible without it. Yet the NIR-10 requires minimum tinkering and does exactly what it is supposed to do: make ham radio contacts easier to listen to. If you are tired of all the noise in your ears, and especially if you spend a lot of time listening, then the JPS NIR-10 is worth having. 73

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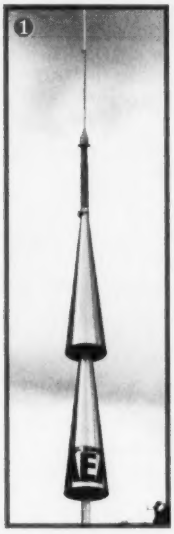

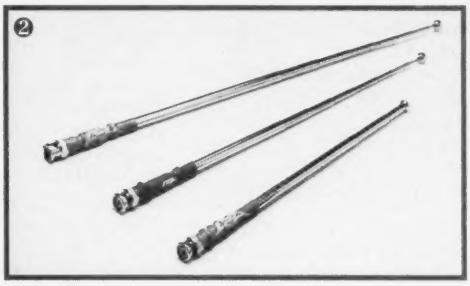

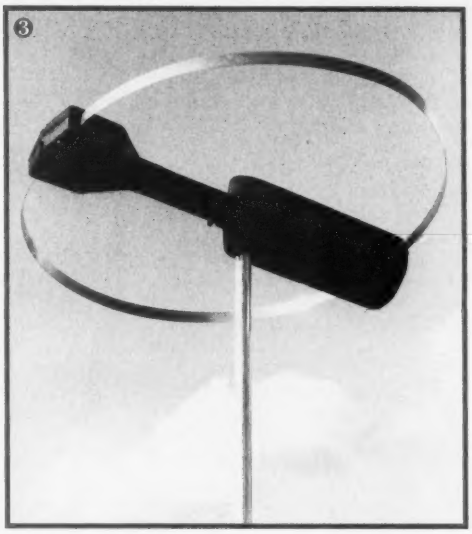

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Impedance	50 ohms	50 ohms	50 ohms
2.1 VSWR bandwidth	10 MHz @ 146 MHz	15 MHz @ 220 MHz	22 MHz @ 435 Mhz
Power Rating	1.0 kW	1.0 kW	1.0 kW
Length	125.5" (3.2m)	79.25" (2m)	46" (1.2m)
Wind Area	< 1 ft^2	< .75 ft^2	< .2 ft^2
Max. Mast OD	1.25" (32mm)	1.25" (32mm)	1.25" (32mm)
Min. Mast Length*	8.0' (2.4m)	5.25' (1.6m)	6" (50mm)
Coax Connector	SO-239	SO-239	Type N

*Mast not included.

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IsoLoop Specifications:

Nominal Impedance	50 ohms
Power Rating	150 watts
VSWR	Less than 1.5:1 (no nearby obstructions)
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Dimensions	43" (109cm) diameter circle
Maximum Mast OD	2" (51mm)
Coax Connector	UHF (SO-239)
Gain over dipole	Depends on elevation

Mast and coaxial cable not included.

Specifications subject to change without notice or obligation. Prices listed are suggested Amateur Net through participating dealers.

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Advanced Electronic Applications, Inc.

P.O. Box C2160/2006 196th St. S.W. Lynnwood, WA 98036-0918
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***Programmable VFO Range Function**
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DJ-F1T

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***Frequency Lock, PTT Lock Function**
***One Touch Squelch De-Activation Function**
***8 Scan Modes**
***Wide Band Receiving Range**

Available Features with Optional DTMF Unit (DJ-10U) and DTMF Keypad (ESK-1) Include:

***Pager and Code Squelch**
***Digital Signal Display and Memory Function**
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***Many Optional Accessories Available**

•Specifications

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DJ-F1T/S1T
TX:144-148MHz
RX:140-170MHz (AM Mode 118-136MHz after Modification)
DJ-F4T/S4T
TX:440-450MHz
RX:430-460MHz

Output Power:
* with Battery Pack EBP-16N (Standard for F1T/F4T)
Hi:2W(F1T/S1T) 1.5W(F4T/S4T)
Mid:1W Low:0.1W
* with Optional Battery Pack EBP-18N
Hi:5W Mid:1W Low:0.1W
* at 9V
Hi:2.5W(F1T/S1T) 2W(F4T/S4T)
Mid:1W Low:0.1W

Weight:
DJ-F1T/F4T Approx.:13.2 oz.: with Standard Battery Pack
DJ-S1T/S4T Approx.:13 oz.: with Dry Battery case

Dimensions:
4.3(H) × 2.1(W) × 1.5(D) inch (Without Projections)

Specifications and features are guaranteed for amateur bands only and subject to change without notice.

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First out, *Radio Fun* is aimed at helping newcomers to amateur radio to both get their higher class licenses and to have more fun with the tickets they have. This means we'll be running simple theory articles to help you actually learn how electronics and radio work. That's a lot better than memorizing the Q&A baloney and feeling dumb for the rest of your life. We're talking simple, so don't panic. Much of this will be the same as we'll be using to teach 5th-8th grade students about electronics and communications.

No, it isn't going to be all theory. The name is *Radio Fun*, so we'll be reviewing every kit we can get our hands on. The idea is to get you to buy, assemble and use all kinds of gadgets - some for amateur radio, some not. There's nothing like building to actually get familiar with electronics and turn book theory into practical understanding.

We'll have columns on activities which are geared to Novices and Techs. We'll be trying to get you involved with repeaters, packet radio, SSB on 2m, satellite communications, DXing on 10m, and stuff like that. We'll also be urging you to forget how much you hate the code and learn it Uncle Wayne's way so you can go on to General and Advanced tickets. How else can we get you up on 15m and 20m so you can help clean up the mess the Extras have made of those bands? We need your help...badly.

Yes, we'll be running stuff on QRP (rigs running under one watt), on hidden transmitter hunting, on how to cope with overbearing old timers at ham club meetings, on how to find parts, on how to put up simple antennas...things like that.

The Premiere Issue will be out in late April and the regular monthly issues will start in September. If you pass up this one you'll never forgive yourself. Just send your order with payment and we'll see that you get the big Premiere Issue, a wad of discount coupons, and our eternal thanks for helping a new ham publication get started. —Wayne W2NSD/1

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5ACM2

73 Review *by David Cassidy N1GPH*

The J•Com MagicNotch Audio Filter

A little box that locks out lids.

J•Com
P.O. Box 194T
Ben Lomond CA 95005
Tel. (408) 336–3503.
Price Class: $100.

Amateur radio is full of gadgets. We have gadgets to measure things, gadgets to amplify things, gadgets to attenuate things, as well as gadgets to help us make other gadgets work better.

Some gadgets end up at the bottom of the closet or drawer. They may operate as advertised, but once you get them installed, you realize that what they do is something that doesn't really need doing. Other gadgets become a permanent part of your setup, because the manufacturer has solved a particular problem. J•Com's MagicNotch audio filter lands firmly in the second category. It's a simple solution to a very irritating problem: interference from a continuous carrier heterodyne signal (like when someone tunes up on top of your QSO).

The MagicNotch is an automatic notch audio filter. It requires no tuning, calibration or attention of any kind. You simply place it in between your rig and an external speaker, supply 12 volts, and turn it on. When the MagicNotch detects the presence of a continuous carrier, it filters it out with a very sharp notch filter. Audio of other frequencies, such as speech, are unaffected and pass through the filter without attenuation.

How It Works

According to the folks at J•Com, the MagicNotch uses a switched capacitor active filter (SCAF), which is scanned through your rig's audio output. A control circuit monitors the filter's output and stops scanning when it detects a continuous carrier. The filter then locks onto the precise frequency of that carrier and notches it out, tracking the interfering signal for any variations in tone until the interference disappears. Then the filter resumes scanning, searching out the next offensive carrier.

On-the-Air Testing

Setting up the MagicNotch is easy, and J•Com includes power and audio cables. The back of the MagicNotch has "audio in," "audio out," and 12V DC in jacks. Connect your rig's external speaker output to the "audio in" jack, connect your speaker to the "audio out" jack, connect 12V DC to the power jack, and you're in business. You can use any filtered power supply for the 12 volts (maximum current at full output is only 200 mA). Many HF rigs operate from 12 volts, and you may have an accessory power jack on your rig. Check your rig's owner's manual. I used a small 3 amp supply that I had sitting around.

The front of the MagicNotch has a 3-position slide switch, an LED, and a mini headphone jack. When you slide the switch to the center position, the MagicNotch is in standby mode (labeled "Bypass" on the panel). The LED will light green (if you've got it wired correctly). As you tune through the band, the LED will flicker to red and back to green. When a continuous carrier is detected, the LED will change to a steady red, indicating that the notch filter has locked onto the carrier. In the "Bypass" position, you will still hear the interference in your speaker. Sliding the switch to the "On" position will place the filter in the audio line, and the interfering signal will be filtered out.

To really get a taste of the effectiveness of the MagicNotch, leave it in the "Bypass" position and tune around for an SSB QSO that is being interfered with by someone tuning up. Switch the MagicNotch to the "On" position and the tuner-upper is gone, leaving only the SSB signal. No matter how weak the SSB signal is, or how strong the CW carrier is, the MagicNotch will eliminate the interference and leave the SSB signal intact.

Now, when a lid tries to tune up on top of your QSO, a simple flick of the switch and the lid is gone. If you leave the MagicNotch in the "On" position, you'll never even know the lid was there.

Be sure to switch the MagicNotch to "Bypass" or "Off" when you want to monitor CW. The filter may notch out what you're trying to copy!

MagicNotch Specifications

Notch depth	40 dB
Gain	0 dB
Active range	200–4000 Hz
Filter Q	10
Power output	2 watts (8Ω load)
Power required	10–14 VDC
standby	40 mA
full output	200 mA
Minimum signal for lock	20 mV P-P
Maximum signal	4 V P-P
Audio connectors	0.125″ mono phone
Power connector	0.220″ coaxial
Size	5.5″ x 3″ x 1.25″

Nice Touches

The MagicNotch is an example of a product that is designed to do a specific task, and it does that very well.

The short instruction manual is well written and informative. The inclusion of the power and audio cables in the purchase price is a courteous and convenient gesture that other companies would do well to imitate.

The front panel headphone jack is a mini-stereo jack that allows you to use the headphones from your portable stereo/tape player. If you've ever spent all day with a large set of headphones clamped to your head, you'll appreciate being able to use lightweight headphones for a change. Some might question the frequency response of headphones intended for music listening used for communications, but I like the more balanced tone of a stereo headphone.

In a hobby full of gadgets, it's nice to find one that is a useful addition to your shack. The MagicNotch is just such a gadget. I call it my "lid filter." 73

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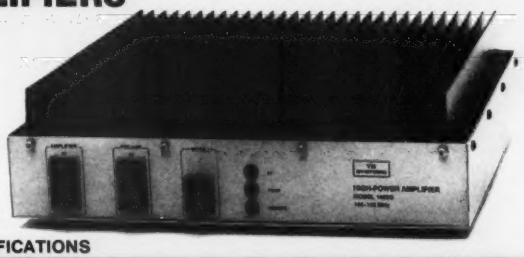

TE SYSTEMS new **HPA Series** of high power amplifiers now available through select national distributors.

All amplifiers are linear (all-mode), automatic T/R switching, and incorporate optional GaAs FET preamp. Amps are usable with a wide input drive level range. Thermal shutdown protection and remote control capability included. All units are designed to ICAS ratings and meet FCC part 97 regulations. Approx. size is 2.8 × 10 × 11.5″ and weight is 8 lbs.

Consult your local dealer or send directly for further product information.

SPECIFICATIONS

Model	Freq. MHz	Power Input	Power Output	Preamp NF-dB	Preamp Gain-dB	DC +Vdc	Power A	RF Conn.
0550G	50-54	10	400	.6	15	13.6	60	UHF
0552G	50-54	25	400	.6	15	13.6	55	UHF
1450G	144-148	10	400	.6	15	13.6	54	UHF
1452G	144-148	25	400	.6	15	13.6	50	UHF
2252G	220-225	25	220	.7	14	13.6	36	UHF
4450G	420-450	10	175	1.1	12	13.6	34	N
4452G	420-450	25	175	1.1	12	13.6	29	N

Models also available without GaAs FET preamp (delete G suffix on model #). All units cover full amateur band – specify 10 MHz bandwidth for 420-450 MHz amplifier. Continuous duty repeater amps also available.

Amplifier capabilities: 100-200 MHz, 225-400 MHz, 1-2 GHz, Military (28V), Commercial, etc. also available – consult factory.

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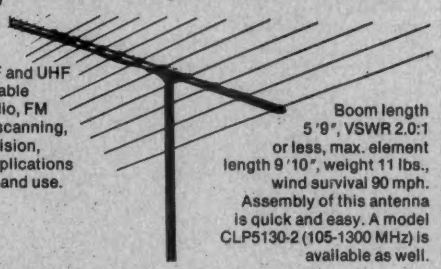
CREATE

CLP5130-1 Log Periodic 50-1300 MHz



This high gain, wide-band VHF and UHF antenna is suitable for amateur radio, FM broadcasting, scanning, VHF/UHF television, government applications and business band use.

Boom length 5′9″, VSWR 2.0:1 or less, max. element length 9′10″, weight 11 lbs., wind survival 90 mph. Assembly of this antenna is quick and easy. A model CLP5130-2 (105-1300 MHz) is available as well.

ROOF TOWERS:

Model	Height	Base Width	Max. Wind Load FT²	Max Vert. Load Lbs.	Weight
CR18	5′10″	31½″	21 @ 90 mph	440	18
CR30	9′10″	39″	27 @ 90 mph	1,322	33
CR45	14′9″	39″	23 @ 90 mph	881	57

CK46 Thrust Bearing—Max. Mast Diameter 2½″

CREATE ROTORS

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RC5A-2	1388	13,020	1¾″-2½″
RC5A-3	1388	13,020	1¾″-2½″

Model	Vertical Load (lbs.)	Horizontal Load (lbs.)	Preset	Indicator Accuracy	Square Feet	Weight (lbs.) (Rotator Unit)
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RC5-3	880	1760	Provided	±4° Max	10	13
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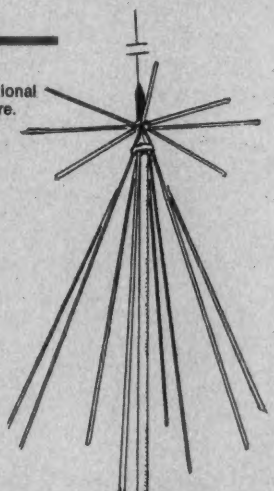

WB 1300
Frequency:
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Transmit—50, 144, 430, 900 & 1200 MHz
Max. Pwr: 200 W
Length: 5′6″
Connector: "N" Type
Mast Dia.: .98″-2″
Weight: 2.2 lbs.

Apartment Antennas: A Challenge

How to cope with a less-than-ideal QTH.

by Stan Gibilisco W1GV

I recently moved into an apartment complex where outdoor antennas are not allowed. This predicament is not unfamiliar to radio hams and shortwave listeners. It does not have to mean a low-performance station, but it inevitably means that there must be some compromises. A full-size, 4-element, 40 meter yagi, and other such antennas, are out of the question.

Here are some of the schemes I have tried so far, and some ideas for future experimentation. I can always go back to my parents' house on the hill to work contests and DX, and this is the attitude I carried into the new apartment.

Survey the Layout

Whatever your particular situation, you will immediately see some obvious possibilities for antennas if you take the time to look things over.

My apartment is on the third floor of a three-story complex. My main motivation for choosing this location was noise: No one will be clomping around above me all day and all night. It turned out to be good from a ham radio standpoint, too. The ceiling is 30 feet above the ground. The building is old, and is therefore probably not of the solid concrete-and-steel Faraday-shield construction typical of newer high-rise complexes. There is a fire escape right outside the living room window, a formidable mass of metal that ought to make an excellent ground for a high-impedance antenna system.

The point is that any apartment will have some redeeming properties for radio communications. Well, almost any. Perhaps my friend who used to live in Arlington, Virginia, had just about the worst deal I have ever seen, a low floor in a jungle of tall buildings. Evidently hamming was not high on his list of priorities.

Any apartment living arrangement presents the danger of RFI and it is far better to put extra effort into the antenna system than to attempt to overcome a deficiency by running high power. I prefer not to get into wars with my neighbors. I'd just as soon have them never suspect I am a radio ham and never have any interference from me. With this in mind, I kept in mind the corollary to the antenna restriction: If you never get caught with an outdoor antenna, then, in effect, you don't have one as far as the management is concerned.

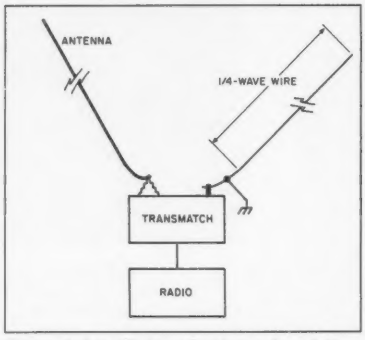

Figure 1. Installation of a ¼ wavelength "radial" wire as an RF ground. The wire should be as straight as possible, and the far end left free.

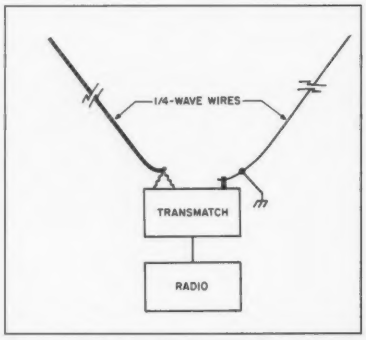

Figure 2. When a ¼-wave, end-fed wire antenna is used with a ¼-wave ground lead, the result is a center-fed dipole antenna. In this case the "radial" contributes to the radiation of the antenna system.

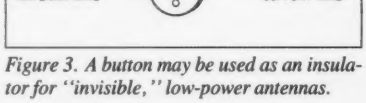

Figure 3. A button may be used as an insulator for "invisible," low-power antennas.

This last statement is not intended as an encouragement to break the rules of your lease. You do that at your own risk. If you try it and get into trouble, I shun all responsibility.

Establishing Ground

I cannot overemphasize the importance of obtaining a good ground for radio-frequency communication. A good direct-current (DC) ground is not necessarily a good radio-frequency (RF) ground.

The term "RF ground" is somewhat nebulous. A good ground at one frequency may be terrible at another frequency. The type of antenna being used makes a great difference.

If the ground loss resistance is given by R_L and the antenna input radiation resistance is given by R_R, then the efficiency of the ground system is given by:

$$\text{Eff}(\%) = 100 \bullet R_R/(R_R + R_L)$$

The higher R_R is, compared to R_L, the higher the efficiency of the ground system. End-fed antennas measuring an integral multiple of 1:2 wavelength tend to have very high values of R_R and are therefore best for use when the RF ground is marginal—and in an apartment situation, it almost always is marginal, at best.

You can get a good RF ground by installing a quarter-wavelength wire at the station transmatch or transmitter chassis, as shown in Figure 1. This will produce high current, and therefore low resistance, at the operating frequency, and also at odd integral multiples of this frequency. Such a "radial" ground wire will radiate to some extent, but this is minimal when the antenna feedpoint resistance is very high. If the antenna is a quarter-wave wire with a rather low feedpoint resistance, the arrangement will combine with the antenna to form a dipole having a feeder length of zero (Figure 2). This arrangement will still function quite well. For multiband operation, multiple "radials" can be installed, each cut to ¼ wavelength at the center of the desired band according to the equation:

$$L(\text{feet}) = 240/f(\text{MHz})$$

where L is the length of the ground lead and f is the frequency. The far ends of these "radials" are left free, not connected to any object.

MFJ Enterprises, Inc., makes a tuner designed especially for resonating an RF ground. According to a *QST* review, this device works quite well.

The Transmatch

I have mentioned the use of a transmatch almost as if it were given that you have one. It ought to be; transmatches are indispensable

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for apartment dwellers and any radio ham who operates portable very often. The added versatility is well worth the cost of the device.

The best transmatches allow for tuning random wires and balanced feeders. Most modern transmatches employ ferrite balun transformers to obtain tuning for balanced antenna systems. This is fine as long as the core does not saturate during transmission. Depending on the impedance at the feedpoint, the core may saturate at power levels much lower than that specified by the manufacturer for operation of the transmatch. I have actually cracked a ferrite balun core using 500 watts output when the transmatch specifications stated that it was usable up to 3 kW. This same transmatch became quite hot during operation using 500 watts output and an unbalanced ⅝-wave wire at 1.8 MHz. The choice of a transmatch is obviously important. In general, those with very large components will be better suited for high power (more than 200 watts output) than those with smaller components, even if the latter carry impressive specifications. Certain laws of nature will not yield to miniaturization technology—not until we have superconductor coils and cryogenic vacuum-variable capacitors!

The main advantage of a transmatch is that it allows practically any antenna to be resonated. You should choose the antenna with efficiency in mind, regardless of the availability of a tuner, but high-impedance antennas, the kind that work best with marginal grounds, generally require a tuner to produce an acceptable standing-wave ratio (SWR).

A Simple End-Fed Wire

Perhaps the simplest antenna is an end-fed wire, running directly to the output of the transmatch and cut so that it is an integral multiple of ½ wavelength on all of the desired transmitting bands. In amateur radio at high frequencies the bands are harmonically related, so if an antenna is cut to be ½ wavelength at 80 meters it will be close to an integral multiple thereof at 40, 30, 20, 15 and 10 meters.

Outdoor antennas are often not allowed, but a thin wire, three stories above the ground, is difficult to see. I recommend enameled copper wire of American wire gauge (AWG) No. 24 or smaller, down to AWG No. 30. The larger wires are physically stronger but more likely to be seen; the finer wires are more likely to break. Don't string such an antenna where it might cause problems for people if it breaks. Keep in mind, also, that if there is a frost, an "invisible" antenna may greet you some morning with an announcement to the world almost comparable to reveille.

The far end of a thin wire antenna may be tied to a button as an insulator, as shown in Figure 3. Allow plenty of slack for the wire to swing with the wind. A strong tree branch is all right for the far end of the antenna, but a solid, stable object is superior since it will not move in a wind. Avoid stringing the wire over or under utility wires. Table 1 gives good lengths for wires for various lowest amateur bands.

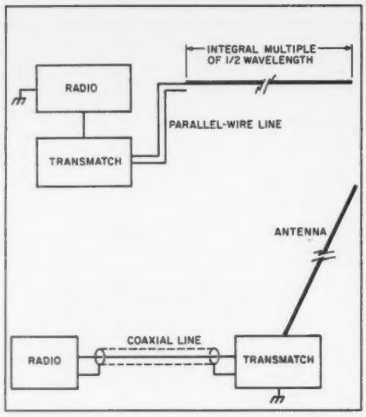


Figure 4. In drawing "a," a parallel-wire feedline is used with an end-fed wire that is very close to an integral multiple of ½ wavelength. In "b," the transmatch is located some distance from the transmitter, and the antenna is end-fed through the transmatch.

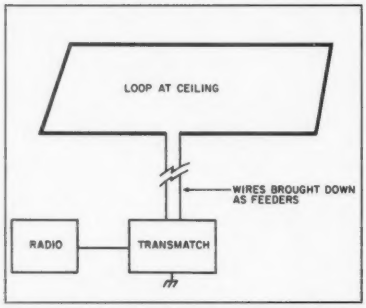


Figure 5. An indoor loop may be fed by bringing the wires down from the ceiling, parallel to each other, to the balanced output of the transmatch.

For shortwave listening the length is less critical, since antenna efficiency is not as important. Generally, a length of at least 50 feet will suffice, although longer wires are recommended for listening below the 160 meter (1.8 MHz) amateur band, and at longwave frequencies, length should be as great as can be managed.

The disadvantage of an end-fed wire is that the radiating portion of the antenna comes right down to the station. However, in an apartment situation where the landlord will not allow rooftop antennas, long feedlines are impractical anyway. If the station must be located away from the window where the antenna comes in, then a parallel-wire line may be used and the antenna connected to one end of this line. However, the antenna must be very close to an integral multiple of ½ wavelength to avoid line radiation (Figure 4a). Alternatively, you can run coaxial cable from the transmitter to the feedpoint, then connect the tuner to the antenna and RF ground at this remote point (Figure 4b). This is inconvenient when it comes to changing bands, but it is the best alternative in some cases. The RF ground must be connected and effective at the transmatch when this scheme is used.

Table 1. Lengths of wire antennas (end-fed) for half-wave operation at various amateur bands. The bands are indicated in meters, with the lowest frequency band first. Half-wave resonant frequencies are given in MHz, and represent the centers of the lowest bands.

Bands of Operation	Resonant Frequency	Wire Length Feet	Meters
160, 80, 40, 30, 20, 15, 10	1.900	246	75.1
80, 40, 30, 20, 15, 10	3.750	125	38.0
40, 20, 15, 10	7.150	65	19.9
30, 15, 10	10.125	46	14.1
20, 10	14.175	33	10.1

An Indoor Loop

Simple end-fed wires may be connected for use indoors, although the lengths may vary somewhat when the wires are not straight. For indoor antennas, a balanced loop is probably better than an end-fed antenna.

Basically, the loop antenna always presents a balanced load at the input. This eliminates the need for a good RF ground and also gets rid of frequency sensitivity. The loop should be at least ½ wavelength, and preferably at least one wavelength, in circumference.

My apartment is quite large, and the ceiling is about 30 feet above ground level. An indoor loop, run around the entire apartment at the ceiling level, was an obvious choice. I installed this antenna almost before I got all the furniture in and the bed made up. I found stranded, insulated AWG No. 20 wire at a surplus shop for a few dollars. Hamfests are great places to get wire like this. I connected the loop to the balanced terminals of the antenna tuner, without regard to the overall length of the loop: I knew only that it was at least 100 feet in circumference, and close to a full wavelength at 7 MHz. I did the tuning on all bands, 80 through 10 meters, and logged the transmatch settings for future reference.

The loop was fed by bringing the end wires down parallel to each other, as shown in Figure 5.

Separate Receiving Antennas

Indoor antennas, and any antenna in a population-dense place like an apartment building, will pick up considerable man-made noise. The noise blanker on my FT-101EE is effective against much of this noise, but some broad-spiked noise is difficult to suppress with any noise blanker. In some cases a special receiving antenna may be needed.

A small loop with a tunable preamplifier is an asset in noisy places. The loop should be rotatable in both the vertical and horizontal planes, allowing you to find the noise null. It can be exasperating when there is more than one noise source and they keep alternating; the loop may need

frequent adjustment. The subject of receiving loops is complex and is beyond the scope of this article. However, Doug DeMaw W1FB has written numerous articles in *QST* about receiving loops.

Commercially-manufactured receiving loop antennas are available. Palomar Engineers manufactures one that has a preamplifier and a ferrite loopstick that can be rotated in both the vertical and horizontal planes.

A separate receiving antenna is, of course, necessary only for ham stations in which there is also a transmitter. When a separate antenna is used for receiving, precautions must be taken to ensure that the signal from the transmitter does not damage the receiver front end or the preamplifier. Some preamplifiers have protection built in. Some don't. Protection may not be necessary at low levels of transmitter power, but it is always a good idea.

That Gremlin: RFI

Radio-frequency interference (RFI) is so common nowadays that, unless you are running milliwatts or are extremely fortunate, you will encounter it in an apartment situation. There are video tape machines, low-cost hi-fi and television receivers, and all kinds of other devices that are susceptible to interference from amateur radio signals. It seems that the problem has multiplied in recent years because of two factors: the greater number of susceptible devices, and the general neglect of manufacturers when it comes to protection from strong electromagnetic fields.

The RFI problem takes a different, reversed form when consumer devices interfere with the radio amateur's communications. Home computers are notorious for this. Other devices, such as cordless telephones, can cause trouble as well. It seems that a double standard applies in the public mind for RFI: It's all right if the radio ham gets interfered with by a consumer device, but it's a cosmic catastrophe if it happens the other way around. It is not my place to say whether or not soap operas and video games are more important than radio communications of a hobby nature, but radio amateurs have to be prepared to face the facts.

In the event of a confrontation with neighbors, the American Radio Relay League, 225 Main Street, Newington CT 06111, (203) 666-1541, may be of assistance. They are familiar with legal cases that have occurred as a result of RFI.

My own attitude is that I won't operate if it interferes with some other person's activities. I don't consider myself that serious an operator. I'll reduce power or operate when nobody else is awake. But not everyone shares this tempered, retiring view. The most the ham can do is be certain that his transmitted signal is "clean"—free of harmonics or other defects in quality—and that he is running no more power than is necessary to carry out the given communications. This power issue is often overlooked: We hams tend to run more power than we need, most of the time. Apartment dwellers must keep constraints such as this in mind.

Many RFI problems can be cleared up by the installation of such things as line filters, better grounds, or different antenna systems. An indoor antenna is more likely to cause RFI than an outdoor one. There is some evidence to suggest that vertically-polarized antennas are more RFI-prone than horizontally-polarized antennas. A two-wire line must be kept in proper balance; a coaxial line must be free of "antenna currents" on the shield.

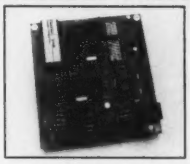
Further Ideas

The outdoor "invisible" end-fed wire and the indoor loop are the two antennas I have tried so far. Of course, there are other possibilities. A balanced "invisible" dipole, actually a shortened random V beam, is another scheme that might lend itself to my situation. This would be a set of two end-fed random wires, each of the same length, connected to opposite poles of the balanced transmatch output. Such an antenna would require no RF ground and would be balanced over a wide range of operating frequencies.

Perhaps the most interesting idea must wait until those long, cold winter nights, when the 1.8 MHz band comes to life. I find it hard to resist this band during those times. I figure if I'm not partying in Miami on those winter nights, the next best thing is a good cup of hot chocolate and an efficient antenna for 160 meters. I have used balloons and aluminum welding wire to make full-size "vertical" antennas of ¼ wavelength and longer on this band. Depending on the proximity of the utility lines, a scaled-down version of this idea might be used in an apartment *[Ed Note: Not recommended for apartment dwellers, it's best to try this in the wide-open spaces of the country. If you try this idea, make sure you are more than the length of your antenna wire away from any power lines, and don't try this on a windy night!]*. The balloon would have to be dark, so that it could not be easily seen at night, and it would have to be small enough to fit through the open window. Then there's the problem of getting the gas cylinder up three flights of stairs without provoking questions or getting a hernia. But, as the saying goes, when there's desire, there's no limit to what one can do. For a radio ham fond of the 1.8 MHz band, winters in the Upper Midwest have a way of cultivating desire. Let's see: a pound of that wire alloy 5356 with a 0.030-inch diameter is about 1,250 feet, so ¼ wave at 1.8 MHz, about 125 feet, would be only 0.1 pound, or 1.6 ounces. A 24-inch balloon would easily lift that, and ought to fit through the window with a little effort. Of course, I'd have to have the lights off so no one would see me climbing out onto the fire escape at midnight in below-zero weather with this two-foot balloon, but that's no problem. A little sign on the windowpane could remind me to switch off the lights before going out... 73

Contact Stan Gibilisco W1GV at 871 S. Cleveland Avenue, Apt. P-12, St. Paul MN 55116.

Natural Voice Products



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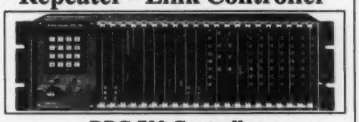
CIRCLE 199 ON READER SERVICE CARD

Repeater - Link Controller



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Up to 4 different Remotes	**+10v to +14v Supply**
Natural Speech Telemetry	**Size : 5.25" x 19" x9"**
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Call for further details

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CIRCLE 282 ON READER SERVICE CARD

73 Review *by Dick Goodman WA3USG*

The SR3 Simplex Repeater from Brainstorm Engineering

Versatile store-and-forward voice controller.

Brainstorm Engineering
3170 Beaudry Terrace
Glendale CA 91208
(818) 249-4383
Price Class: $330 with PL decoder installed; $230 without PL decoder.

The concept of a "simplex repeater" is quite simple. It is a voice store-and-forward device very similar to a packet digipeater. Additional hardware requirements are minimal—only one standard voice-grade radio and antenna is required for operation. The primary advantage to this type of repeater is in its simplicity. There are no duplexers, multiple antennas, external receivers, or auxiliary equipment needed. It can be installed in an automobile using an existing transceiver, driven to a high location, and put into operation immediately. It may even be used with a handie-talkie to provide portable repeater capabilities in a package considerably smaller than 1 cubic foot.

Sounds too good to be true, doesn't it? Well, it has a few disadvantages over a conventional repeater. Since it uses a single radio channel, it is a "half-duplex" device. The user keys his or her transceiver, speaks for a limited period of time, unkeys the transceiver, then hears the message repeated. The person that the user is communicating with would also hear this message and respond in the same manner. It's not really conducive to rag-chewing, but it is quite practical for applications where one or more people need to communicate but are out of range of each other. The simplex repeater can be centrally located, allowing everyone to communicate through it.

Photo A. The Brainstorm Engineering SR3 Simplex Repeater.

Until recently, simplex repeaters used either endless tape loops or standard cassette tapes as the voice storage media. While the user transmitted, the tape transport recorded the transmission. As long as the user had the transmitter keyed, the tape ran. When the transmitter was unkeyed, the transport went into a "rewind" mode, rewound the tape, and replayed the message. This caused a delay in repeating the original message, and it was a mechanically complex operation subject to problems. With the availability of inexpensive voice digitizing and storage devices, this inherent mechanical problem has been solved.

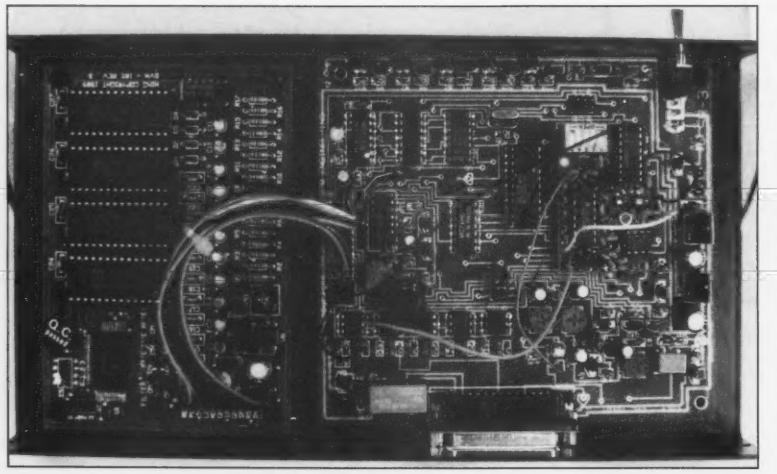

Photo B. Inside view of the SR3.

Enter the Brainstorm Engineering SR3 Simplex Repeater

The Brainstorm SR3 is packaged in a sturdy, all-metal case that you could almost drive a car over. Its dimensions are: 10.5″ wide, 6″ deep, and 1.75″ high. It performs all the functions of a simplex repeater with none of the problems of the older, mechanical units. The power requirements are 11.6 to 15 VDC at approximately 200 mA. As well as functioning as a simplex repeater, it serves as a simple voice mailbox system, and a voice repeater IDer. All modes of operation can be controlled by DTMF tones.

The documentation that comes with the SR3 is excellent. It includes clear and concise specifications, operating instructions, and configuration data. The block schematics and circuit board layouts are high quality line drawings that are easy to read and will enable virtually anyone to interface the SR3 to a variety of radios.

Configuration, Setup and Operation

The front panel of the SR3 is simple and uncluttered. There are five "status" LEDs, and a power switch. All input and output to the SR3, including power, is via a DB-25 connector located on the rear panel. Brainstorm Engineering includes all connectors and cables necessary to get the SR3 up and running. Interfacing the SR3 to the radio is quite simple. Connections are made to the microphone audio input, the PTT input (the SR3 PTT line goes low at transmit), and the external speaker audio output. The SR3 has internal adjustment of both TX and RX audio levels. There are two versions of the SR3: the PL (Private Line) subaudible tone version, and the non-PL version. The unit reviewed here was the PL version, and I recommend it highly as it adds

considerably to the versatility of the unit.

As well as the connections to the radio identified above, the SR3 needs to know when a signal is being received by the radio connected to it. There are pins on the DB-25 interface connector that may be connected to any point in the radio that goes high (2–12 VDC) when a carrier is received. Many radios have "busy" LEDs that serve this purpose well. I used the "busy" LED on my Heathkit HW-2036 and it worked nicely. The problem with this is that the radio must be modified for this to work. Also, some of the newer rigs use an LCD "busy" indicator which may not have the correct voltage level for the SR3. If you have the PL version of the SR3, this is not a problem. Whenever the SR3 hears the correct PL tone from the user's radio it assumes that a carrier is present. The big advantages of this are that absolutely no modifications are required of the radio, and communication may take place on the SR3's frequency, without being repeated, by simply turning off the PL on the user's rig. The PL version will detect the presence of the carrier by either the voltage level or the PL method.

The SR3 is extremely reliable and easy to use. The three operating modes—"simplex repeater," "voice mailbox," and "voice repeater IDer"—can be enabled or disabled via DTMF input from the user. It should be noted at this point that only one mode may be used at a time. For example, if the SR3 is in the "simplex repeat" mode it cannot be a "voice IDer." The SR3 comes standard with memory for storage of 16 seconds of voice. A maximum of 64 seconds may be installed by adding additional SRAM chips.

The Simplex Repeater Mode

This is the mode that the SR3 defaults to after power-on reset. When the SR3 senses a carrier, it immediately goes into the "record" mode and stores the user's audio until the carrier drops. When the carrier is gone, the SR3 keys the transmitter and plays back the received audio. I found that after playing a bit with the RX and TX audio level adjustments, excellent audio quality could be obtained. I tried out the "voltage level" COR carrier detection technique in the shack and it seemed to work well. The PL carrier detection really shines, however. It worked quite reliably with all stations that tried it.

The Voice Mailbox Mode

This is a simple voice mailbox. It will store only one message at a time. If additional messages are entered, they will overwrite the original message. The mailbox mode may be entered via the proper DTMF code.

There are two ways to leave a message. In the first method, the user keys the transmitter, dictates the message and, without dropping the carrier, presses the correct DTMF key. The message is now stored and will be repeated any time the SR3 senses a carrier. The SR3 will not interrupt a QSO on frequency, but the message will be repeated each time a carrier is sensed and dropped.

In the second method, prior to dictating the message, the user keys the transmitter and enters the correct three-number DTMF code, states the message, and sends the correct two-digit DTMF code. This all must be done without unkeying the transmitter. Now the message will only be repeated upon receipt of the correct DTMF code from the recipient. This may sound complex, but it is relatively easy to master.

The Repeater IDer Mode

This is a simple but effective way to either voice-ID your conventional repeater, or to generate announcements of general interest. The SR3 contains a timer that may be set from about 10 seconds to 20 minutes. After loading a message or ID, the SR3 will output this message the first time the repeater is keyed. After this, the message will be disabled until the SR3's timer has reset. Upon completion of this reset, the message is enabled for transmission the next time the repeater is keyed. By sending the correct DTMF tone, the message may be generated at any time.

Other Features

The built-in DTMF decoder allows complete control of the SR3 remotely. Messages, IDs and voice mail may be entered and overwritten using the correct codes. The SR3 may also be taken completely off line via DTMF control. An additional feature is a DPDT relay option that can be user-installed. This lets you pick up or drop out a relay via DTMF control. Use the relay contacts for your own control purposes.

Other Uses

Tim Barefoot KA3ATH has been of great assistance in this review. He interfaced the SR3 into his home station. A number of guys in the Keystone VHF Club of York, Pennsylvania, played around with it. All three modes of the SR3 were exercised and worked well. Everyone was thoroughly fascinated with hearing their own voice being repeated back. The Keystone Club is in the process of putting up a 440 MHz/50 MHz linked repeater. We presently have the SR3 interfaced as a simplex repeater on the 6 meter side. It is interesting to drive around different areas of the county, store voice audio in the SR3, and play it back. It has told us a lot about the coverage that we expect to get from the repeater. We will probably try the SR3 on the 440 MHz side when we get it completely up and running.

I have experimented with sending SSTV audio into the SR3 on 2 meters with my Robot 1200. The audio back from it reproduced the original picture reasonably well. An SR3 placed in a central location would allow all members of a club to evaluate the operation of their rigs by allowing them to listen to their own signal coming back. Finally, an SR3 in your shack in the voice mailbox mode would allow you to leave a message for the XYL, even if she was not home at the time.

I found this device to be quite interesting and intriguing! There are many other uses for it, and one has to let his or her imagination set the limit. With the advent of inexpensive digital electronics, I hope that other products will be as innovative as the Brainstorm Engineering SR3 when they hit the market. 73

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DX

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Richardson TX 75083

Expedition News

A5 Bhutan. Jim VK9NS and Kirsti VK9NL are planning to operate from Bhutan, beginning around May 1. This will be the second operation for Jim, who signed A51JS last year.

US0UT. During February and March, Nick UB5UT was active from Lavrentiya with this special callsign. Lavrentiya is located just across the Bering Strait from the mainland of Alaska. For DXCC purposes, a contact with this station counts for the DXCC country of Asiatic R.S.F.S.R. (UA9/UA/0). QSL via Romeo Stepenenko, Box 812, Sofia 1000, Bulgaria.

UNSC8R1—Guyana. This is not a new type of antenna; it is the callsign of a new station operating from Guyana (8R1). The operator told K5OVC that this is the callsign typed on his license, and he is using it accordingly. It should probably be more like 8R1UNSC. QSL to Juan Larrabure, 42 Brickdam, Georgetown, Guyana.

Pirates. 3A0RA was a pirate. Don't waste your time or money sending a QSL to W4RA for a contact with him. Larry W4RA knows nothing about this station and is certainly not the QSL manager. 5X5GH, who also said to QSL via W4RA, is also believed to be bogus.

5A1DX was also a pirate; don't bother QSLing to W4BFQ for this one.

The station signing VU2TU/VU7 (Nicobar Islands?) appears to be a pirate. VU2RX is reported to have said that Indian regulations do not allow Indian stations to use a portable callsign. This station, if it had been legitimate, would have signed VU7TU.

XZ9A Burma. The persistent operation by XZ9A during February was the work of a pirate. The operator said to QSL via JA8IXM. JA8IXM knows nothing about this station.

QSL Notes

VK9MR and VK9LHI: Not via VK2WU. The manager for VK9MR (Mellish Reef) and VK9LHI (Lord Howe Island) is NOT the current license holder of the callsign VK2WU. The former VK2WU, who was the QSL manager for both stations, has moved, changed callsigns, etc., and evidently did not finish answering QSL card requests for either station. Does anyone know the whereabouts of the logs for these stations?

ET2A Ethiopia. There is a station on the air from Ethiopia! We've been getting bits and pieces of rumors during the past few months about a possible ET operation, but nothing worth printing . . . until February. The station is ET2A and the main operator is Jack W4IBB. Jack's wife and another operator named Scott may also operate the station from time to time. Jack has been trying to obtain a license for a year and a half!

There is a written license (which may be renewed), and by now it should have been forwarded to to the DXCC Desk. The station consists of a TS-140S transceiver and various antennas. Don't expect much, if any, CW activity from Jack, but Scott may give it a go. QSL via WB2WOW.

Publications for DXers

The ARRL has published a new book on DX. Mark AA2Z, ARRL Publications Manager, describes *The DXCC Companion: How To Work Your First 100 Countries,* by Jim Kearman KR1S, as: "Intended for new DXers . . . it covers the sport of DXing from making the first DX contact to applying for the DX Century Club (DXCC) award. Everything the beginner needs to know about antennas, propagation, working 'split,' sending QSLs, and working DX on nets and lists, is presented in a bright, humorous style."

KR1S's publication doesn't cover everything, but it is a fine publication, and it certainly contains most of the information the beginning DXer needs. It's informative, easy to read, and certainly a worthy addition to any new DXer's library.

You can order *The DXCC Companion,* a 129-page soft cover book, from the ARRL, 225 Main Street, Newington CT 06111. The cost is $6.00 (plus $2.50 for postage and handling; $3.50 for UPS).

A booklet, "Russian Phrases for Amateur Radio," is available from Len Traubman W6HJK, 1448 Cedarwood Drive, San Mateo CA 94403. The cost of this booklet is $5. A 90-minute cassette tape is available for $6.

Special Prefixes

1H0, 1C4, 1P1, etc. The "one" prefixes are unassigned, but several callsigns with the "one" prefix have been adopted for use by stations operating from the DXCC countries of the Spratly Islands (1S) and the Sovereign Military.

Order of Malta (1A0KM). "One" prefixes have also been used on a regular basis by American operators when on IOTA expeditions. For example: NE8Z/1C4 and K1RH/1H0 from one of the islands in the South Carolina Group (IOTA designator NA-110) and several Texans have used the 1P1 prefix from Pelican Island (Galveston, Texas). The use of the self-assigned "one" prefixes by U.S. operators is not illegal.

7S3OWG Olympic Winter Games 1998. The special callsign 7S3OWG will be used until June 15 by members of the Jentlands ARC (SK3JR) to promote Ostersund (Sweden's candidate for the 1998 Olympic Winter Games). QSL via SM3CVM. 73

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QSL Routes

3D2WZ	via G3WZ
4K1ADQ	Vlad Ivanov, P.O. Box 88, Kolpino-3, Leningrad, USSR
4U1ITU	ARRL DX CW (Feb.91) via N6TR
8P6NX	via W0SA
9H1EU	via WA4JTK
9M6ET	via WB2KXA
9M6HF	via WE2K
9M8GB	via DJ1UJ
9M8RH	via DJ4OI
9M8WB	via DK7UY
A71AM	via DJ9ZB
A71CD	P.O. Box 1007, Doha, Qatar
AT0NRO	via VU2APR
BY1BJ	Box 6111, Beijing, People's Republic of China
C21JM	New: Jim Motiti, P.O. Box 359, Republic of Nauru, Central Pacific
CN8NY	Yousef, Box 6557, Rabat, Morocco
EL2SM	via SM3HML
ET2A	via WB2WOW
FY5FP	via ON4ZD
HH4TD	not via KP4NL
HR2BDC	Dean Cary, Box 7373 Eagle Pass, TX 78853
IS1W	via I1RBJ
IU8A	via IK8DOI
J6LTA	via NI4M
JH0BBE/JD1	via JH0BBE
JT8AA	Box 49, Altaj 050000, Mongolia
K8MFO/6Y5	via W8TPS
KB5NIV/DU4	via WA5ADH
KH0/JI3XRZ	via JF3KOZ
P29AC	via VK8AC
P29DK	via KE4EW
PA6A	via PA0CLN
PW8XX	via PY1AJK
PY0RC	via PY5SM
RA1AKB	Box 300, Kronshtadt City, 189610, USSR
RL7GEK	Box 1, Alma-Ata 480068, Kazakh, USSR
RZ1A	P.O. Box 417, Leningrad 191011, USSR
T30DQ	via DL5UF
T30DR	via DL2GBT
T30DS	via DJ9ZB
TA2/RF6FO	via WA2NHA
TG9CXM	via K3BYV
TJ1BJ	via K4UTE
TJ1CW	via F6EEM
TJ1YL	via F6FYP
TR8WJH	via G4TWT
TY2AB	via IK8DOI
UZ3MWD	Dimitry Orekhov, P.O. Box 80, Jaroslavl 150000, USSR
V63BH	via JA1UZI
VE4GV/6Y5	via VE4GV
VP2VM	Feb. 1991 via KU2Q
VP2V/K5NA	via KU2Q
VP2V/KU2Q	via KU2Q
VQ9WM	via K7IOO
WA6VRS/DU3	Terrell Cohen, PSC 3, P.O. Box 15556 APO San Francisco CA (do not put call on envelope)
WE6C/BV2	via WU6X
XF0C	via XE1BEF (Clarion Island)
XV5XA	via JA1AH
YY5P	via YV5ARV
ZC4MT	Box 413, Larnaca, Cyprus
ZV7BI	via PT7BI
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ZX0MXK	via PY2MXK

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ATV in Space

When the STS-37 shuttle mission blasts off this April 4th, it'll be the second time an ATV receiver has been put into space. The first was the 1265 MHz receiver on the Webersat microsat. The next step? How about an ATV *transmitter* in space?

Project Excelsus

Students from Southeastern Community College in Whiteville, North Carolina, plan to launch their own space mission sometime in mid-May. Instructors Ben Frink and David Couvillon KC4WDW, along with Simms Spears, have put together a team of electronics and physics students who are busily assembling a very unique rocket/balloon (Rockoon) system.

The Rockoon

The students' ultimate goal is to launch a live *color* camcorder and an ATV transmitter to an altitude in excess of 50 miles (the beginning of space!). To accomplish this they are building a 10-foot long rocket (6 inches in diameter) which will carry a color camcorder and a PC Electronics KPA5-RC 1 watt ATV transmitter (439.25 MHz). A second transmitter on 1255 MHz FM TV (T.D. Systems) will send back pictures from a B/W camera. Even though they will be using a large Vulcan "M" size rocket motor, they could only reach a maximum height of a few thousand feet if launched from the ground. However, the plan is to fly the rocket up to 100,000 feet attached to a large plastic balloon (RAVEN model 52k). Since 100,000 feet is above most of the atmosphere, igniting their rocket from this point could send it up over 350,000 feet high.

Many government Rockoon flights have been flown to study the upper atmosphere. Some of these have made it well over 100 miles up.

The Rockoon consists of two separate packages, the rocket ATV system and the launch control platform. Telemetry from the platform is relayed down to mission control via a packet link designed by PacComm. The fire command is issued via this link which activates a special ignitor circuit. In addition, a third ATV camera and transmitter on 426.25 MHz will be located on the platform which will allow us all to monitor the rocket and watch the liftoff! There will be packet telemetry on 2m FM from the rocket as well as the launch platform. The final telemetry frequencies will be announced a few weeks before the flight.

Since the rocket won't achieve anywhere near orbital velocity, it will come back to earth as soon as it hits the maximum altitude. After ignition, the whole flight into space should only take a few minutes.

The Rockoon will be launched from the North Carolina shoreline and should drift about 50 miles out to sea before the rocket is fired. That way the rocket will return for a splashdown in the Atlantic. Several chase boats will be on hand to attempt a recovery.

Go Along for the Ride

Anyone within 400 miles of the launchsite should be able to receive the balloon transmission and watch the launch of the rocket. If the rocket makes it up to 50 to 100 miles, you may be able to watch spectacular views of space from over 700 miles away! At any rate, it ought to be quite a ride! For those of you using a *cable-ready* VCR or TV, you can tune in the rocket ATV transmitter on cable channel 60 and the control/ignitor camera on cable channel 58 (use a good vertically polarized 70 cm antenna for best results). An HF net will convene before and during the flight on 7.155 MHz with launch updates. It will also collect reception reports.

High Flying ATV at SCC

The Rockoon flight is the culmination of several

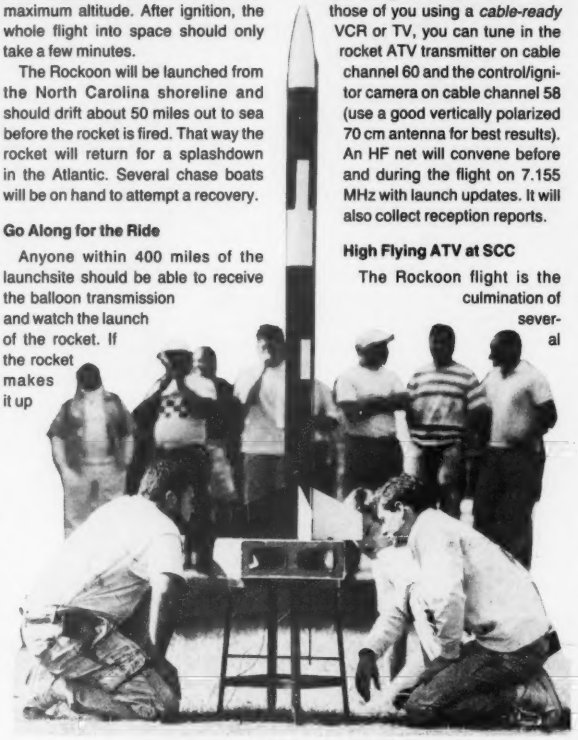

Photo A. The first SCC rocket ATV flight.

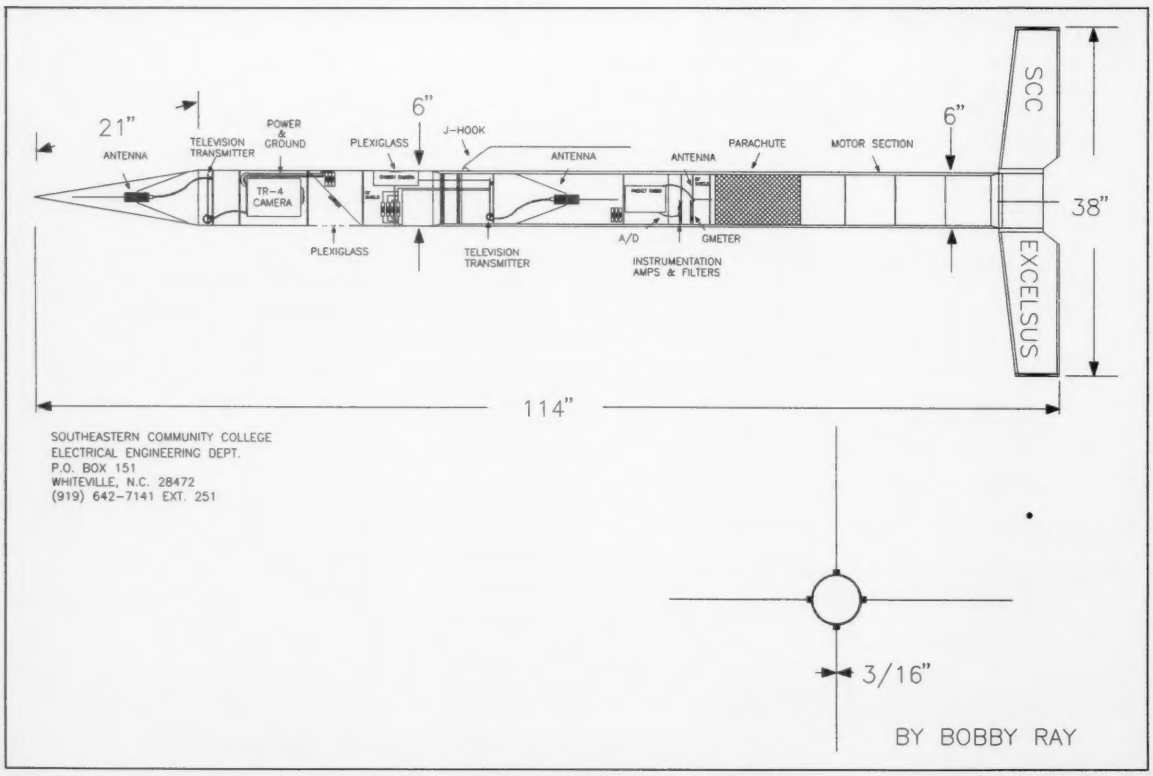

Figure. Diagram of the SCC space probe. Drawing by Bobby Ray.

Enjoy NEVER CLIMBING YOUR TOWER AGAIN

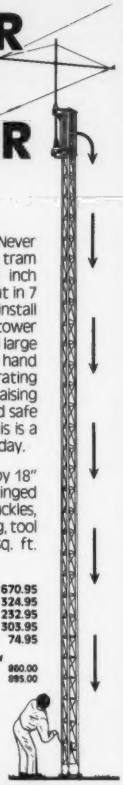

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Photo B. A few members of the launch team holding the first balloon payload. From l ro r: Simms Spears, David Couvillon KC4WDW, Ben Frink, Bob Rau N8IYD and Bill Brown WB8ELK.

west of the ocean. Although local Wilmington, North Carolina, radio club members gave it their best shot, it was nearly impossible to get any signal through the dense pine forests in the area. Fortunately, two days later, a local resident found the payload lying in a ditch on the side of a small road.

The SCC group hope that these ATV experiments will inspire other schools to develop projects of their own. It's a great way to learn electronics while doing something new and exciting.

Launch Info

Update . . . The cross-country manned ATV balloon flight covered in last March's column has been postponed until September. Look for further information and updates about this flight and Project Excelsus via AMSAT bulletins (both the nets and packet BBSs) as well as the Tuesday night ATV net on 3.871 MHz (8 p.m. Eastern time).

Dayton HAM TV Activities

Plenty of ATV activities can be found this year at the Dayton Hamvention. Check out the Friday evening (7:30 p.m.–midnight) annual ATV PARTY at the Holiday Inn North (just off exit 57-B on Interstate 75). Since over 150 ATVers attended last year's party, this year it will be held in the Grand Ballroom (seats 300). Lots of great speakers, demos and, of course, ATVers from around the world. Quite a contingent from the BATC (British Amateur Television Club) plan to attend this year.

The ATV Forum will once again be chaired by Tom O'Hara W6ORG at O'Hare arena on Saturday afternoon. Look for talks by Tom W6ORG, Carole Perry WB2MGP, Dave Baxter W5KPZ and myself.

While at Dayton, listen in to the action on either 144.34 MHz or 147.45 MHz. SEE you all there! 73

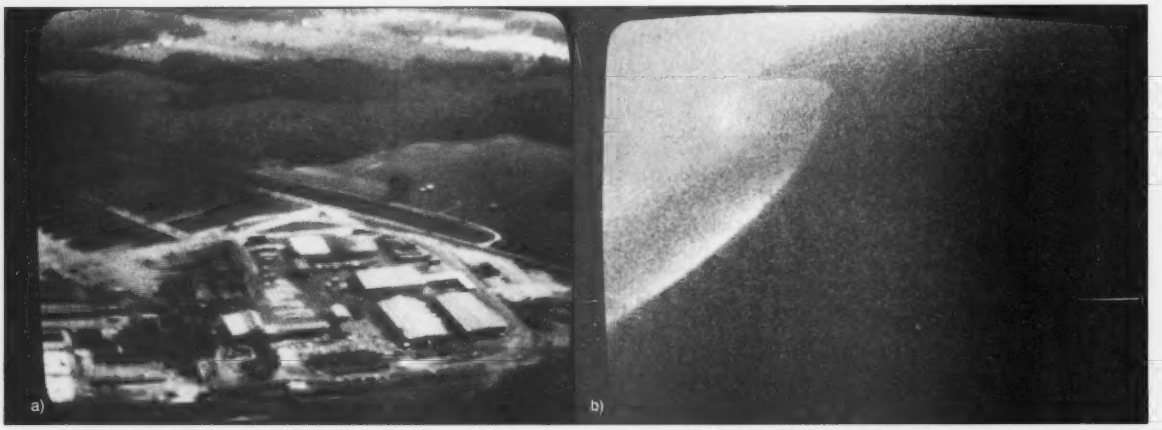

Photo C. Downlink video from the live camera payload. (a) the Georgia Pacific plant from 2000 feet. (b) 200 miles of the North and South Carolina coastline as seen from 65,000 feet.

airborn experiments that students at Southeastern Community College have performed. Their first flight consisted of a 4-foot model rocket with an HVM-322 camera and a TV transmitter which the students designed in their electronic engineering techology class. This flight was launched last May from the campus parking lot up to about 800 feet. When the camera popped out of the fuselage, you could see the crowd of onlookers getting closer and closer as the package parachuted back down. It was great to see the smiling face of the lucky student who caught it before it hit the ground!

The class became inspired by their initial success and invited Bob Rau (rocketeer) and me (balloonatic) down to help them launch their next payload on a high-altitude balloon. Just after noon on October 23, their live camera ATV payload was launched from the SCC campus attached to a 5-foot weather balloon. The class gathered around the ATV receive station at mission control (the electronics lab), fascinated by the spectacular views of the North and South Carolina countryside coming down from the balloon system. At 65,000 feet nearly 200 miles of the Atlantic coastline could be seen. Thanks to the efforts of Hap Griffin WA4UMU, visitors to the ATV booth at the Sumter, South Carolina, hamfest were watching as well. In addition, Fred Tuck WD4KTI and Don Fortner K4SAO had good reception from Inman, South Carolina (200 miles). One of the most amazing reception reports came from Ken Gallagher W3DFS in Adelphi, Maryland (350 miles away) who reported a completely snow-free P5 signal for about 10 minutes!

After the balloon burst, the package parachuted down to land just 8 miles

Photo D. Southeastern Community College students hard at work building the Excelsus *rocket. I to r: Jan Knotts, Bobby Ray, Marty Scott, Chris Gilliard, Tim Andrews and Chris FormyDuval.*

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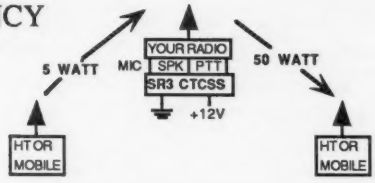

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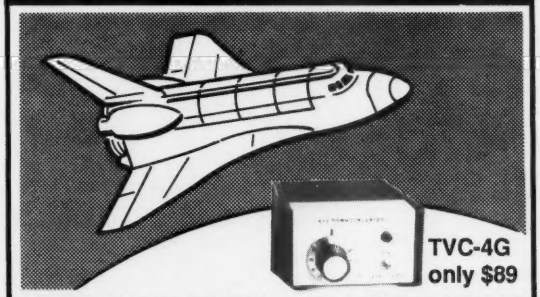

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HAMS WITH CLASS

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An Invitation to 4U1UN

Most of us would agree that any 8th grader should be able to speak intelligently about the United Nations, its background, and its role in the world today. Imagine my surprise at learning that only 20% of my 400 students in the 6th, 7th, and 8th grades could even identify the world famous profile of the UN Building at 42nd Street in New York City! My incredulity grew as I discovered that most of them didn't realize that we, in Staten Island, were within 45 minutes of the UN Complex.

You can hardly open a newspaper or listen to a TV news broadcast without some visual representation of the UN in the background. The world crisis centering around the Persian Gulf, and the recent role of the General Assembly, should have prompted provocative discussions in every school in the country. It is appalling to think that so many youngsters have disfranchised themselves intellectually from discussions or opinions about world events. The responsible adults among us should point out that it's their future hanging in the balance, too, and that they have an obligation to be well-informed about the decisions that world leaders are making.

We often get involved in discussions on current events as a direct result of contacts we make on the radio to different parts of the world. The teacher of an amateur radio course can easily bring in topics from other studies to the classroom. I was especially delighted, therefore, when I received an invitation to visit the United Nations amateur radio station, 4U1UN. This would be a great opportunity to bring information about this world body back into the classroom in a meaningful and exciting way.

I shared my feelings of excitement with the children. Suddenly, students were telling me what they'd heard about the UN on the news on TV, and they began bringing in newspaper articles about the General Assembly and the Security Council.

On Tour at the United Nations

When the big day arrived, I was given a list of questions prepared by the children in their social studies classes. Their teachers were delighted with the interest, and it was gratifying to me to be part of a team effort in education.

Upon my arrival at the UN, I was met by David Rosen K2GM, the station manager of 4U1UN. David was my gracious host for the day. During a wonderful lunch at the UN restaurant, we spoke about the background and history of the UN.

The UN is an international organization of sovereign nations, established to serve the cause of peace. According to its Charter, the UN attempts to do this through political action, such as mediation or prevention of conflicts among nations, and promotion of higher living standards through economic and social action. Its purpose is to develop friendly relations and cooperation among nations, and to serve as a center for harmonizing international action.

Since 1941, the UN has had several different sites. In 1946, the General Assembly accepted $8,500,000 from the American philanthropist John D. Rockerfeller, Jr., to purchase a 16-acre site bordering the East River between 42nd and 48th Streets in Manhattan. Later the site was granted extraterritoriality status under the Headquarters Agreement concluded between the UN and the U.S. on June 26, 1947. Plans for the famous UN Complex were drawn up under the guidance of American architect Wallace Harrison, and unanimously adopted by the General Assembly in November 1947. The cornerstone was laid on UN Day, October 24, 1949, and work was completed by the middle of 1952.

The four main buildings are the General Assembly Hall, the Conference Building, the Dag Hammarskjold Library, and the Secretariat Building, which houses the amateur radio station 4U1UN.

In 1946, the UN adopted its official emblem, a map of the world seen from the North Pole, surrounded by two wreaths of olive branches. The UN flag, adopted in 1947, displays this emblem in white, centered on a light blue background.

Station 4U1UN

After an extremely informative tour of the complex, we spent several hours at 4U1UN. UN staff from all over the world, such as Panama, Sri Lanka, and Poland, comprise the UN Amateur Radio Club, of which Raymond East KB2BKO is president.

In order for the station to assist more efficiently, a special group of volunteers has been organized. The group consists of both amateurs and nonamateurs from the UN staff. Since 1986, 4U1UN and this support group have participated in 11 disaster operations.

Most importantly, the group has expanded to include a growing number of amateur stations outside of Headquarters who work closely with 4U1UN during crises. Most of these stations have been prominently involved with emergency activities in the past; they include WA1KKP, VP2MO, NP2CM, W8CZN, OA4OS, VS6VO, W9ARV, and K2EWB. Many other stations have recently joined the activity.

David emphasized that the Radio Readiness Group is entirely an amateur radio undertaking, and that stations interested in assisting 4U1UN when the normal channels of communications have been severed, are welcome to call in.

During disasters, when amateur communications are required, the net will meet on specified frequencies. The principal frequency is 14.268 MHz, with 14.168 as an alternate (traffic is also handled on other alternate frequencies as specified at the time). Other frequencies are 3768/3868/7068/7268/21368/28468.

During disasters, 4U1UN has been in liaison with relief agencies and other official entities. One such agency is UNDRO. "The United Nations Disaster Relief Organization" acts as a coordinator in the provision of aid to stricken areas. During emergency periods, 4U1UN has furnished UNDRO with post-event information about catastrophes. Situations involving hurricanes, volcanoes, and earthquakes are all helped by the rapid relaying of information by the amateur community.

Between the UN Headquarters-based Radio Readiness Group, with all of their area and language expertise, and the dedicated efforts of the Radio Readiness Group with the assistance of amateurs worldwide, it is hoped that 4U1UN and the Radio Readiness Group can make a difference.

David offered these priorities:

1. To address the emergency requirements in the disaster area as it pertains to the preservation of life.

2. To determine in a precise manner the extent of damages and needs—e.g., medicine, food, and shelter.

3. To optimize activities to be of the most value to the stricken area requires organizing the Headquarters and on-the-air group so that both elements may efficiently respond.

4. To efficiently expedite health and welfare traffic.

Members of the 4U1UN station feel that their amateur radio efforts meet the principles of the founding countries of the UN. It embodies what the nations of the world expected of the UN when they founded it.

They hasten to add that emergency support activities are also prioritized by all the amateur radio service, and they acknowledge the good work other emergency nets have done.

David pointed out that Resolution No. 640: Relating to the International Use of Radiocommunications in the Event of Natural Disasters, in Frequency Bands Allocated to the Amateur Service (WARC 1979) has now been incorporated into the amateur regulations of several telecommunication administrations.

Photo A. Carole Perry WB2MGP, enjoying working 4U1UN.

Photo B. David Rosen K2GM, station manager of 4U1UN, stands beneath the 4-element yagi on the UN building's roof.

On the roof, there is a wonderful array of antennas, including a Hy-Gain TH4, a Cushcraft 103CD, a Create CL 10DX 6-element 10 meter beam, dipoles for 40 and 80 meters, and a DX-88 7-band 10–80 vertical. A ruggedized Telrex 20M536 5-element, 20 meter beam is on hand and awaits installation. At the station, which I had the pleasure of working that day, is a Kenwood TS-940S and a Kenwood TL922A amplifier. David said their objectives are to install equipment sufficient to allow 4U1UN to operate on several bands simultaneously.

My visit to the UN was a personal treat for me, and also provided the opportunity to bring world events into the classroom through amateur radio. Peace through communications should be a goal for us all. 73

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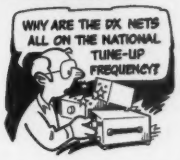

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RS-14

RS-14 is up and active. It's hard to believe a 200 mW satellite beacon can be loud enough to be detected on any 2 meter antenna with almost any 2 meter receiver. Launched on January 29 of this year, RS-14, also known as RADIO-M1, RUDAK-2, or, as I intend to refer to it, AMSAT-OSCAR-21, has been sending CW telemetry on 145.822 MHz since February. The German-made digital experiment has also been energized for tests, and the linear transponders should be active by the time this column is printed.

In early 1989 Leonid Labutin UA3CR met with Hans Peter Kuhlen DK1YQ and other members of AMSAT-DL (West Germany) to propose a joint effort in the design and construction of an amateur radio satellite. Leo represented the AMSAT-U-ORBITA group and the Moscow Adventure Club, both of the U.S.S.R.

The groups agreed to work together on the program, and to design and build their portions of the satellite in time for a scheduled launch only six months away. The electronics would become a physical part of a Soviet geological research satellite called GEOS.

The Soviet group AMSAT-U-ORBITA worked primarily on the linear transponders and associated telemetry systems. They named their part of the system RADIO-M1. The "M" represents the cities involved in the program: Molodechno, Minsk, Moscow and Munich.

The Soviet's CW telemetry comes down at 20 words per minute, and you can hear it on any portable, home, or mobile 2 meter rig capable of CW/SSB reception. In between the eight groups of four digits each, the satellite identifies itself as RS-14. From home stations, the only obvious way to tell that the signal is not from a nearby transmitter is to listen to the Doppler shift on the signal's frequency as the satellite passes overhead. See Table 1 for frequency data. This is an updated version of the chart presented in the July 1990 "Hamsats."

The German contingent built a new version of their RUDAK experiment. RUDAK is a German acronym for "Regenerative Umsetzer fur Digitale Amateurfunk Kommunikation," or "Regenerative Transponder for Digital Amateur Radio Communications." The prototype RUDAK system worked for over two years from the top of a water tower in Ismaning, near Munich, Germany. The first flight-ready RUDAK system was a part of AMSAT-OSCAR-13, but it had minor wiring problems that had a disastrous impact. The experiment was never completely activated.

RUDAK is a complex packet store-and-forward system capable of input and output via many modes and data speeds. The original system was designed for high elliptical orbits where the satellite is in the sky for long periods. It was designed to rely on real-time digital communications (digipeating) with less emphasis on store-and-forward techniques.

RUDAK-2 on A-O-21 is in a low orbit, similar to the microsats. It is available several times a day, but only for short periods. This new version of RUDAK is built for bulletin-board features and other experiments that lend themselves to short access periods with much less emphasis on the digipeating capabilities.

Many signal types could be heard on the RUDAK-2 downlink frequency during initial tests from space. On February 25, stations around the world were surprised to hear speech on the RUDAK-2 output of 145.983 MHz. In a clear voice, with a slight touch of European accent, RUDAK announced, "I'm completely operational and all my circuits are functioning perfectly." This message repeated continuously for several orbits. On other occasions, very-high-speed data could be heard. It sounds like hissing over a span of several kHz.

The RUDAK system supports FSK (frequency shift keying), BPSK (biphase shift keying), RSM (rectangular spectrum modulation) and DSP (digital signal processing) operation. The DSP system works with any input or output for which programs have been created and activated in the spacecraft computer. This includes digital rates to 25K

Table 1. RADIO-M1/RUDAK-2 Data Sheet
Orbit Configuration

Polar circular orbit with average height 980 km (610 miles), inclination 83 degrees, period 104 minutes. Attached to GEOS, a Soviet geological research satellite. Launched in late January 1991 (from AMSAT-DL and AMSAT-U).

Frequency Guide

	Linear Transponder 1	Linear Transponder 2
Mode B Uplink	435.102–435.022	435.123–435.043
Mode B Downlink	145.852–145.932	145.866–145.946
CW Beacons	145.822	145.948
PSK Beacons	145.952 (1200 bps)	145.838 (1200 bps), 145.800 (1100 bps)

Regenerative Transponder RUDAK-2

Uplink	RX-1	RX-2	RX-3a	RX-3b	RX-4	Unit
Frequency	435.016	435.155	435.193	435.193	435.041	MHz
Speed	1200	2400	4800	9600	DSP	bps
Modulation	FSK	BPSK	RSM	RSM	any	
Coding	NRZIC	Bi–Ø–S	NRZIC	NRZI	I+Q	
	Bi–Ø–M	Bi–Ø–M	NRZ-S+scrambler			

Downlink **145.983 MHz with 3 Watts typical (10W optional)**

Mode 1: 1200 bps, BPSK, NRZI (NRZ-S) (like FO-20)
Mode 2: 400 bps, BPSK, Bi–Ø–S (like OSCAR-13 beacon)
Mode 3: 2400 bps, BPSK, Bi–Ø–S (planned for OSCAR-13)
Mode 4: 4800 bps, RSM, NRZIC (Bi–Ø–M)
Mode 5: 9600 bps, RSM, NRZI (NRZ-S) + Scrambler
Mode 6: CW keying (only for special events)
Mode 7: FSK (F1 or F2B), i.e. RTTY, SSTV, FAX, etc.
Mode 8: FM modulated by D/A signals from DSP (speech)

Technical Data

DC Power
Total system: 40W maximum
RUDAK-2 power consumption: 14V @ 350 mA (max) = 4.9W
Standby: 80 mA (RUDAK without power amplifier)
RF Output Power
CW Beacons (L/H): 0.2/0.4W
Digital Beacons (1200 bps/1100 bps): 0.4/2.0W
Transponders: 10W maximum
RUDAK-2 (L/H): 2/10W (3W typical)

Table 2. Radio-M1/RUDAK-2 PSK
Telemetry decoding information.
Digital-Telemetry of "RADIO-M1"
by AMSAT-U (RC2CA/UA3CR)
and AMSAT-DL (DG2CV/DB2OS)

Digital telemetry consists of 30 parameters + 2 constants. To receive the digital telemetry, you must use an FM receiver, a modem, a de-scrambler, and a personal computer.

Digital Telemetry Equations

Line	Parameter	Formula	Unit
1	Transponder #1 HF output pwr	0.2N	Watt
2	Transponder #1 PA temperature	0.8*N	deg. C
3	DC/DC converter temperature	0.8*N	deg. C
4	+14V Regulated	10*N	Volt
5	+24V Regulated	10*N	Volt
6	+16V Regulated	10*N	Volt
7	+12V Regulated	10*N	Volt
8	+9V Regulated	10*N	Volt
9	+7.5V Regulated	10*N	Volt
10	+5V Regulated	10*N	Volt
11	+9V Regulated (linear)	10*N	Volt
12	+9V Regulated (digital)	10*N	Volt
13	Service	N	*
14	Service	N	*
15	Transponder #2 HF output pwr	0.2*N	Watt
16	Transponder #2 PA temperature	0.8*N	deg. C
17	+24V Regulated	10*N	Volt
18	+16V Regulated	10*N	Volt
19	+10V Regulated	10*N	Volt
20	+9V Regulated	10*N	Volt
21	+7.5V Regulated	10*N	Volt
22	Status command link 1	*	*
23	Status command link 2	*	*
24	Status command link	*	*
25	Status command link	*	*
26	RPC +5V for Rudak-1	2.47*N	Volt
27	RPC +5V for Rudak-RTX	2.47*N	Volt
28	RPC +5V for Ramdisk	2.47*N	Volt
29	RPC +14V total supply current	627-289*N	mA
30	RPC module temperature	56.7*N-49.5	deg. C
31	"Zero" of the comparator	0C	
32	Reference voltage	6D	

$$N = \frac{(i-0C)*1.16}{6D-0C}$$ where 'i' is the parameter value in hex format.

or $$N = \frac{(i-12)*1.16}{96}$$ where 'i' is the parameter value in decimal format.

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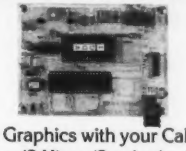

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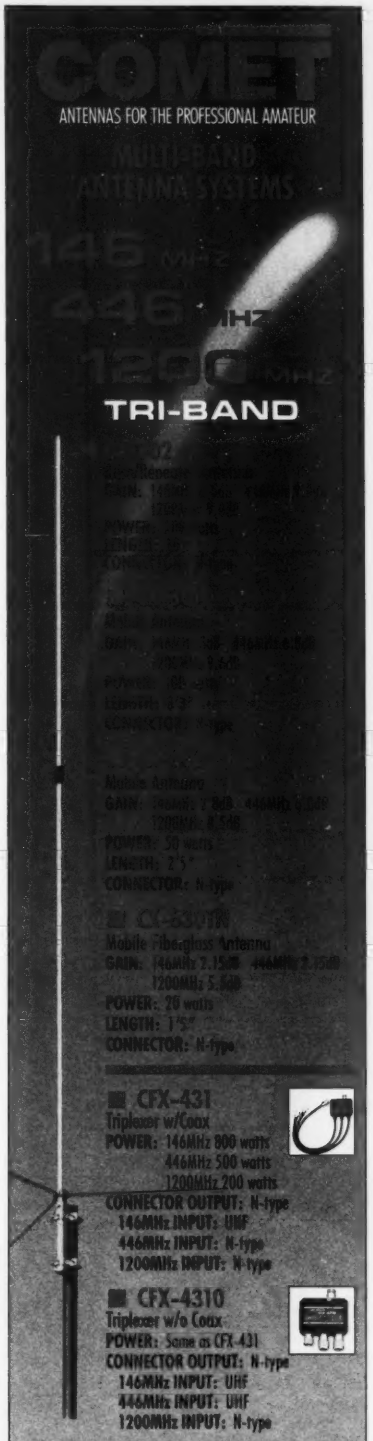

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bps, voice, and other modes not yet invented.

The linear transponders were not activated for use early in the satellite's life, but with several watts available for transponder activity, A-O-21 promises to be extremely easy to work. The transponders, configured in Mode B, are inverting. A 70cm lower-sideband uplink signal is retransmitted on upper-sideband. Similarly, a signal sent in the lower portion of the uplink band will be heard high in the 2 meter downlink span. Omnidirectional antennas will be sufficient for those wishing to use the satellite.

Decoding A-O-21 telemetry provides insight into the satellite's systems. While the equations for the CW data have not yet been released, the digital telemetry can be deciphered with data from Table 2. The 1200 bps (bits per second) PSK beacons can be translated by PSK/packet systems capable of receiving Fuji-OSCAR-20's digital mode or the microsat downlink signals.

The 1100 bps transmissions are not as easy. Although this signaling rate is a standard in the Soviet Union, it is nonexistent in the U.S. A DSP (digital signal processing) device with a modem program for 1100 bps PSK is the best alternative.

Table 3. RS-12/13 Frequency and Data Sheet

Orbit Configuration

Polar circular orbit with average height 980 km (610 miles), inclination 83 degrees, period 104 minutes. Attached to Cosmos 2123, a Soviet navigational satellite (NAVSAT). Launched in February 1991 from Soviet command station RS3A.

	Frequency Guide	
	RS-12	RS-13
Mode A Uplink	145.910–145.950	145.960–146.000
Downlink	29.410–29.450	29.460–29.500
Mode K Uplink	21.210–21.250	21.260–21.300
Downlink	29.410–29.450	29.460–29.500
Mode T Uplink	21.210–21.250	21.260–21.300
Downlink	145.910–145.950	145.960–146.000
Mode KA Uplinks	21.210–21.250	21.260–21.300
	145.910–145.950	145.960–146.000
Downlink	29.410–29.450	29.460–29.500
Mode KT Uplink	21.210–21.250	21.260–21.300
Downlinks	29.410–29.450	29.460–29.500
	145.910–145.950	145.960–146.000
Beacons	29.408–29.454	29.458–29.504
	145.912–145.959	145.862–145.908
	Autoanswer ROBOT	
Modes	A, K, T, KA, KT	A, K, T, KA, KT
Uplink	21.129 and/or 145.831	21.138 and/or 145.840
Downlink	29.454 and/or 145.958	29.504 and/or 145.908
	Technical Data	
DC Power		
All system OFF	4.6W	3.5W
All system ON (max)	35W	25W
RF Output Power		
Beacon and Robot (L/H)	0.45/1.2W	0.45/1.2W
Transponder TX	8W	8W

RS-12/13

On February 5, 1991, one week after the launch of RS-14/A-O-21, Cosmos 2123 went to orbit. It is a replacement for Cosmos 1655 which has been operational since May 30, 1985. The new Cosmos is a civilian navigation satellite and incorporates RS-12/13 into the main power bus. The older satellite did not require replacement as early as previously anticipated, so launch was delayed for over a year.

Table 3 shows an updated version of the amateur radio frequency chart that originally appeared in the September 1989 "Hamsats." Like RS-10/11, RS-12/13 has three main modes and associated ROBOT autotransponders. Frequency bands have been offset to avoid interference with RS-10/11, but otherwise the new system is identical.

During the first few days of life in orbit, RS-12 and RS-13 systems were checked for proper operation. Tests were going well until the Cosmos 2123 150 MHz transmitter began interfering with the RS-12 2 meter receiver. Digital signals heard within the RS-12 10 meter downlink were obviously not of an amateur origin. Efforts have been underway by command stations to circumvent this problem. If the satellite's 2 meter receive predicament continues, RS-13 may be activated, or Modes K (15 meters up and 10 meters down) or T (15 meters up and 2 meters down) on RS-12 may be turned on instead.

Mode A operation requires an uplink signal, either CW or sideband, within the passband limits on 2 meters. Ten watts to a home station omnidirectional antenna does the job on most passes. A 10 meter receiver with a MOSFET preamp and dipole will work for the downlink.

The 10 meter downlink resides just above 29.4 MHz. Interference from terrestrial FM stations is very common in this portion of the band. Many hams are not aware of the internationally accepted satellite downlink band limits of 29.3 to 29.51 MHz. FM receivers can barely detect the presence of the weak sideband and CW signals from the satellites. An uninformed FM operator with a strong signal can wipe out several satellite conversations and not even notice that a serious problem exists. The ARRL "Operating Manual" clearly defines the 10 meter band plan with extracts from the ITU (International Telecommunications Union) Radio Regulations Table of Frequency Allocations.

Mode K with its 15 meter uplink and 10 meter downlink is a mode where many newcomers make their first satellite contact. Although it is difficult to avoid interference between a 21 MHz transmitter and a 29 MHz receiver at a home station, it is possible. Many have done it. Transmit and receive antennas must be kept segregated to avoid receiver overload. Coax cables should be of good quality and kept apart. Finally, transmitter power on the 15 meter uplink should be only enough to make contact through the transponder. There is no band plan for 15 meter satellite operation. When calling "CQ," specify "satellite" or "RS."

Interference between the 15 meter transmitter and 2 meter receiver is rarely a problem for Mode T activity. The downlink signals are easy to copy, but there is a problem with this mode for U.S. amateurs. The transponder limits on RS-10/11 allowed Novice class operation, but RS-12/13 does not. Only Advanced and Extra class hams can use Mode T via RS-12/13. Those with an Extra class license can use sideband or CW anywhere within the transponders, but Advanced class hams must avoid operation below 21.225 MHz. Consider upgrading!

Even with license limitations, RS-12/13 offers exciting satellite communications. Together with A-O-21, the scope of amateur satellite activity has been dramatically increased with these new resources launched from the Soviet Union. 73

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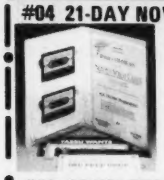

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$59.95 (Optional Chip Socket $7.50)
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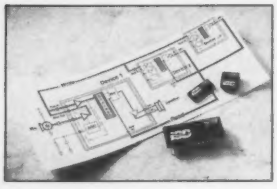


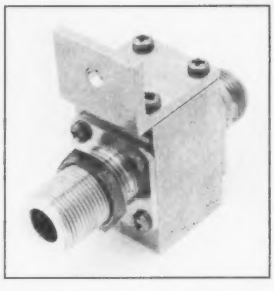
ISD

ISD has introduced the world's first implementation of non-volatile analog storage on a chip. The ISD1016, a single-chip voice messaging system, offers up to 16 seconds of telephone-grade voice recording and playback. With the addition of a microphone, speaker and just a couple of resistors and capacitors, you have an audio recorder on a chip! Applications can range from simple repeater IDs to voice mailbox systems. Multiple ICs can be cascaded for additional storage time. Twelve-second and 20-second versions are available as well (ISD1012 and ISD1020). The ISD1016 represents an exceptionally tiny solution with a miniscule energy budget, true zero-power nonvolatile storage array and extremely easy-to-use features.

For prices and more information, contact *Information Storage Devices, Inc., 2841 Junction Avenue, Suite 204, San Jose CA 95134; (800) 825–4473, (408) 428–1400, FAX (408) 428–1422.* Or Circle Reader Service No. 201.

POLYPHASER

PolyPhaser Corporation has added a new series of Nuclear Electro-Magnetic Pulse (NEMP) lightning suppressors to their popular line of coax protectors. The IS-NEMP series has threaded type "N" connectors standard on all equipment port interfaces. They handle up to a maximum surge of 50,000 amps with a ≤ 1.25 ns turn-on time, and 330 VDC voltage. They also have multi-strike capabilities, ≤ 1.1:1 VSWR, ≤ 0.1 dB IL, and throughput energy of ≤ 30μ Joules (based on 1 kV/ns waveform).

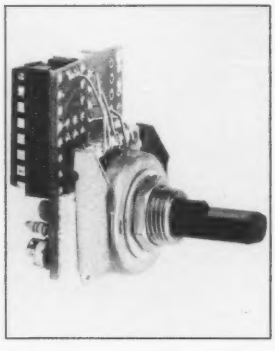


For prices and more information, contact *PolyPhaser Corporation, P.O. Box 9000, Minden NV 89423-9000; (800) 325–7170 or (702) 782–2511.* Or circle Reader Service No. 202.

COMMUNICATIONS SPECIALISTS

Communications Specialists is offering a miniature multi-tone encoder that permits selection of a discrete CTCSS or burst tone from a custom 12 (Model SS-12) or 16 (Model SS-16) tone memory. The tone is activated by a rotary encoder switch mounted on the board. In place of the usual DIP switch found on the old SS-32P encoder, these new boards have a 12- or 16-pole rotary encoder switch mounted on the bottom of the board. Up to 12 or 16 tones of your choice are programmed into the EEPROM before shipment, and can be changed later at no charge. The small size (1.3" H x 0.9" W x 0.73" D) allows for panel-mount installation in most base stations and many mobile radios.

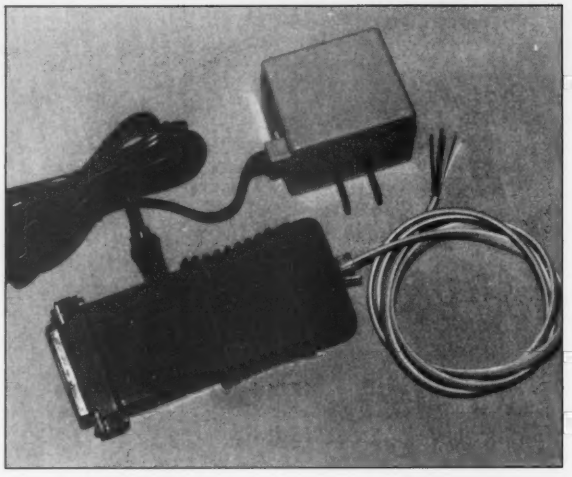
The SS-12 and SS-16 are priced at $39.95 each. Contact *Communications Specialists, Inc., 426 West Taft Avenue, Orange CA 92665-4296; (800) 854–0547, (714) 998–3021, FAX (714) 974–3420.* Or circle Reader Service No. 207.



EDWARD OROS

Edward Oros has released a conversion kit for the Uniden HR2600 and 2510 10m band radios, allowing them to transmit on 12m, making them dual-banders. The "Plus 12" conversion kit is easy to assemble and install—no drilling required! The total conversion time is less than one hour. All required parts and instructions are supplied with the kit.

The kit sells for $49.95, plus 6% sales tax for PA residents. Group discounts are available. Contact *Edward Oros, 2629 Sapling Dr., Allison Park PA 15101.* Or circle Reader Service No. 203.



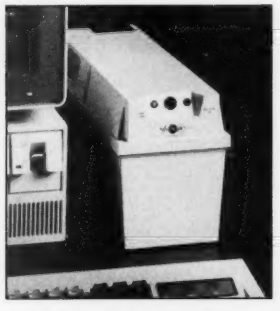
DELTA RESEARCH

Delta Research has introduced DELTATONE 2.0™, the perfect complement to your repeater controller. The DELTATONE interface (hooks up to your computer's printer port) and your MS-DOS computer offer unlimited 16-digit DTMF tone generation for local or remote programming of the repeater controller. DELTATONE has three programmable tone speed settings. It accepts programming information from a control file created on your favorite PC word processor. Commands and comments can be freely mixed within the file. Its command language allows complete flexibility of tone selection, three sending speeds, selectable one-second delay between digits, a pause (tone off) until a key is pressed and, for level calibration, it will hold the last digit on until a key is pressed. It also has Morse code identification capability.

DELTATONE 2.0 is priced at $149, plus shipping and handling. Contact *Delta Research, P.O. Box 13677, Wauwatosa WI 53213; (414) 353–4567.* Or circle Reader Service No. 205.

TRIPP LITE

A new, compact UL-listed battery backup system from Tripp Lite, featuring 450 VA of power and LAN compatibility, offers superior performance for PC work stations. The BC-450 LAN Battery Backup System is UL-listed under UL-1778 (UPS systems) and supplies 450 VA of continuous power while providing complete spike, line noise and RFI/EMI filtering.



The BC-450 LAN, priced at $449, is part of Tripp Lite's new family of small UL-listed battery backup systems, also available in 275 VA and 375 VA sizes. Contact *Tripp Lite, 500 N. Orleans, Chicago IL 60610-4188; (312) 329–1777, FAX (312) 644–6505.* Or circle Reader Service No. 206.

CHIPSWITCH

The CHIPSWITCH is designed to expand the existing features of the Uniden HR2510/HR2600/LINCOLN 10m radios. It features 30 memory channels with temporary channel lockout and repeater offsets, programmable SCAN/SEEK function, programmable channel UP/DN buttons, programmable microphone UP/DN buttons, programmable transmitter timeout, split frequency operation, programmable transmit frequency range, and priority channel operation (requires additional hardware).

CHIPSWITCH retails for $59.95, plus postage, including the Operator's Manual and Installation Guide. An optional chip socket ($7.50) and priority channel board ($29.75) are also available. Contact *CHIPSWITCH, 4773 Sonoma Hwy., Suite 132, Santa Rosa CA 95409–4269; (801) 224–4130.* Or circle Reader Service No. 204.

THE GRAPEVINE GROUP

The Grapevine Group's new catalog of computer parts and accessories includes the hard-to-find spare parts and upgrades that Commodore C-64 owners need. This 34-page catalog comes in two editions: one for end users, and one for dealers.

Contact *The Grapevine Group Inc., 3 Chestnut Street, Suffern NY 10901; (914) 357–2424, (800) 292–7445, FAX (914) 357–6243* Or circle Reader Service No. 208.

UPDATES

International Radio and Computer, Inc.

Robert A. Pohorence, President of the above company, writes: "We have closed our operation at the Port St. Lucie location and consolidated our business and personnel at our new headquarters in Fort Pierce. The new address is 3804 South U.S. 1, Fort Pierce FL 34982. The telephone numbers are (407) 489–5609 and 879–6868; the FAX number is (407) 464–6386. Also, as of January 1, 1991, International Radio and Computer, Inc., bought the Fox Tango trade name and assets."

C-64 & 1541 Drive 12V Conversion

John Neeley K6YDW writes: "Following is an update on my article, "C-64 & 1541 Drive 12V Conversion," that appeared in the July 1990 issue of *73*, pages 26–30.

"1. Ramsey Electronics no longer carries the TB-6 60 Hz Time Base kit. If you need it for the project, you can build the home-brew version in Figure 3.

"2. In some instances, depending on the terminal program or TNC you use, this 60 Hz clock is not required. Do the power wiring conversion first, then try it out to see whether this is the case. The clock is probably not required if you don't use the disk drive, such as when you use the AEA PK-88 and Digi-Cart programs. This was brought to my attention by readers who did the conversion."

More on the Frequency Standard

Refer to the article, "High Precision Frequency Standard," by Johnson in the January 1991 issue, and the March "Updates" on same. Edward E. Burkhardt of WRTV: "Paul: Typical expected Doppler shifts of domestic geostationary satellites cause frequency shifts in the order of 1 x 10^{-8} which result in color burst changes of 0.03579 Hz from the origin point—not 'about 1 Hz.'

"Even in Los Angeles or New York, color burst can be used only if the station's frame synchronizer is also tied to the atomic standard.

"You [Paul] mentioned your station is locked to WWV 60 Hz as a condition of license. The 60 kHz calls are WWVB. Phase-locking to WWVB results in frequency errors on the order of 1 x 10^{-8} during daytime propagation changes. Please tell me more about your 'condition of license' to be locked to WWVB—this is a new one to me.

"Brad: You should not have used the word 'percent' in '2.79 x 10 to the minus 6th percent'. Rather, it should read, '2.79 x 10^{-6}.'"

Dual Voltage Bench Supply

Angus E. Smiley: "In your October 1990 issue, page 10, 'Dual Voltage Bench Supply,' you never give a part number for Q1, the NPN transistor. I'd like to know what it is."

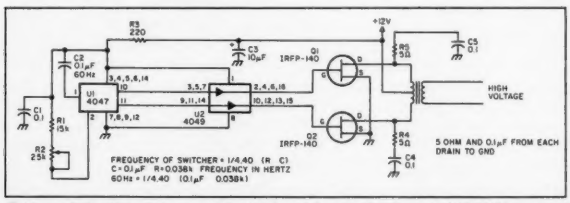
Hugh Wells W6WTU, the author, says you may use a common 2N2222 or 2N3904. Either will work fine.—Eds.

The Switcher-Driver

As promised in WB6IGP's "Above and Beyond" column in this issue: The schematic for his home-brew power supply switcher-driver. The foil pattern and parts placement diagrams are in the August 1990 issue. 73

Switcher-Driver Parts List

R1	15k	1/4W
R2	25k	pot
R3	220 ohm	1/4W
R4,5,6	5 ohm	1/4W
C1,4,5	0.1 µF	
C2	select 0.1 µF for 60 Hz capacitor; can vary from 0.1–0.12 µF with a resistor value of 38k (25k pot + 15k) pot; allows frequency adjustment.	
Q1	IRFP140 FET100V @32 amps max	
Q2	IRFP140 approx. 200W max	
U1	CMOS 4047 multivibrator	
U2	CMOS 4049 Hex inverter	



Schematic for the power supply switcher-driver in the August 1990 "Above and Beyond."

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Here are a few of the Ultra's Features:
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Ultra Com Shack 64 Options
*Mount All modules Including C64, Predrilled & painted incl mounts & cable clamps ALBX .....$ 159.95
*Digital Voice Recorder 32 or 64 sec. voice Mailbox & ID tail, Inc. 1 Meg Ram, control with CS8 or PK8, Incl. cable for REV8 Ultra board, 5 or 12VDC DVM...$ 179.95
*Operate C64 & 1541 from 12Vdc with this crystal controlled Switching supply, runs cool & efficient draws <1 amp, Plugs into C64, fused, protected Model DCPS.....$ 129.95
*Add duplex Control of Remotes & patch with Telephone amplified hybrid, null & gain pots Plugs into CS64S board, TLCN.... $159.95
Autoboot EPROM cart plugs into C64 or PK8, disk or System version CART... $ 109.95
8 relay On/Off; Inc. 3 -DPDT 2 A. relays +5 Sw. outputs, Use with HM1 to rotate beam.....CS 8.....$ 99.95
2 Voice Meters + 2 Alarm Inputs + 8 Relay On/Off Sw. PK8.....$159.95
*PK1 adds Program & Control of Ultra via Packet or Tel line + Packet to Voice BBS, Req. 2nd C64 & PK8, Inc. 4 ft. data cable to PK8.....PK1...$99.95
*Rotor control Analog to digital converter; use with CS8; voice bearing +/- 5 deg. for all rotors HM1...$ 69.95
Ultra Com Shack 64 Manual all schematics, diagrams, how to operate& set up remote base. Refund with purchase of CS64S.MN.$25.00
AUDIO BLASTER™ Works in all H.T.'s
AB1S <--Miniature Audio Amp/ Used by police Module installs inside all H.T's; 1 watt audio amp ! When it needs to be loud! Universal installation diagrams. AB1S.... $ 24.95
TSDQ QUAD TSDQ 4 DIGIT Touchtone Decoder QUAD Relay Expansion plug-in option TSDQ use as Repeater On/Off, C64 reset, 8/20 VDC , audio in; Field Program 50,000 Codes; Mom. & Latching; Inc. DPDT Relay; LED digit valid & latch; 24 Pin connector. QUAD option adds: four 2 Amp. relays + 5 digit on & off code for each relay. 2"X3" Expandable TSDQ..$ 89.95 Optional QUAD...$ 99.95
Touchtone to RS232 300 Baud Interface "Decode-A-Pad" Use with all computers Decodes 16 touchtones Includes Basic program
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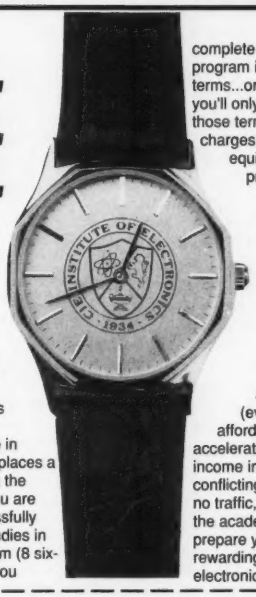

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Amateur Radio Software

With construction and gadgets the major topic of this month's *73*, we'll concentrate on a type of gadget here in "RTTY Loop." To wit, I'd like to present some of the most requested "gadgets": RTTY software.

The following information was obtained mostly from flyers supplied by software vendors or, in some cases, from reviews in *QST*. Please check with the vendors for the latest product details and pricing.

Apple II Amateur Radio Software

List compiled by N6BIS, last updated 1/7/91. (These products are not endorsed by Apple Computer, Inc.)

Packet Radio *APR (Apple Packet Radio).* For use with TNC-2s. Requires a Super Serial card in the computer. Larry East W1HUE, P.O. Box 51445, Idaho Falls ID 83405-1445. Send a blank 3.5-inch or 5.25-inch Apple II disk and a stamped, self-addressed disk mailer.

PACHAM. Uses a two-microchip interface instead of a TNC. DaJu Development Company, 39 Long Ridge Road, Carlisle MA 01741. Price, $49.95.

Morse Code Practice *Morse+Plus Morse Code Tutor.* EPO Software, 7805 NE 147th Avenue, Vancouver WA 98682. Price, $15.95.

Note: The Sept. 7, 1990, *ARRL Letter* mentioned that the Computer Foundation for Handicapped Children has some Morse code programs for the disabled. Contact them at 2645 East Southern, Tempe AZ 85282 for details.

Morse Code & RTTY Operation *HAM.* Sends and receives both Morse code and RTTY. DaJu Development Company, 39 Long Ridge Road, Carlisle MA 01741. Price, $49.95.

Code Machine. COTEC, 13462 Hammons Ave., Saratoga CA 95070. Price, $29.95 (discount if bought with another COTEC program).

RTTY Machine. COTEC, as above. Price, $29.95 (discount if bought in conjunction with another COTEC program).

Satellite Tracking *Apple QuikTrak.* AMSAT, P.O. Box 27, Washington, DC 20044. Price, $25 for AMSAT members; $35 for non-members.

Antenna Design *Antenna Design & Dimensions.* EPO Software, 7805 NE 147th Avenue, Vancouver WA 98682. Price, $9.95.

Antenna Trap Designing. Larry East W1HUE, 119-7 Buckland St., Plantsville, CT 06479. Send blank formatted disk with stamped, self-addressed return disk mailer.

Logging *Electrolog II,* EPO Software, 7805 NE 147th Avenue, Vancouver WA 98682. Price, $18.95.

Contest Log & Dupe Sheet. EPO Software, as above. Price, $13.95.

Macintosh Amateur Radio Software

List compiled by N6BIS; last updated 11/24/90.

Packet Radio *NET/Mac (KA9Q TCP/IP).* Supports AX.25 and NET/ROM as well as TCP/IP functions. Requires a TNC with KISS mode. Doug Thom N6OYU, 1405 Graywood Drive, San Jose CA 95129. Send formatted 800K Macintosh disk with stamped, self-addressed return disk mailer. Also available via anonymous FTP from apple.com (/pub/ham-radio) and platypus.uofs.edu (/pub/HAM-RADIO); on the Digikron Systems BBS at (408) 253–1309; the WB3FFV BBS at (301) 625–0817, 625–9482, and 625–9663; and the N8EMR BBS at (614) 895–2553 (or via AMPR.NET FTP at 44.70.0.1). The KA9Q package is copyrighted, but free for noncommercial use.

MacRatt with FAX. Terminal program for use with AEA's PK-232 multimode controller. Supports packet, CW, RTTY, AMTOR, and facsimile. Includes computer-to-TNC cable. Advanced Electronic Applications (AEA), P.O. Box C-2160, Lynnwood WA 98036. Price, $59.95.

Morse Code Practice *N6MZV Morse Trainer.* RT Martin, N6MZV, 10382 Orange Avenue, Cupertino CA 95014. Also available via anonymous FTP from apple.com (/pub/ham-radio). Price, $25.00.

Morse Tutor. Jack Brindle WA4FIB, Brincomm Technology, 3155 Resin Street, Marietta GA 30066. Send formatted 800K Macintosh disk with stamped, self-addressed return disk mailer. The program is copyrighted, but free for noncommercial use.

MacMorse. David A. Kall, 700 Marine Parkway #314, New Port Richey FL 34652. Price, $29.95.

Zihua Morse. Zihua, P.O. Box 51601, Pacific Grove CA 93950. Price $39.95 without speech synthesis; $65 with speech synthesis.

RTTY *MacTTY.* Summit Concepts, Suite 102-190, 1840 41st Ave., Capitola CA 95010. Price, $39.95.

Logging *LOGic.* Personal Database Applications, 2634 Meadow Bend Court, Duluth GA 30136. Price, $75.00.

FDLog! System One Control, 3900 85th Ave N, Suite 200, Brooklyn Park MN 55443. Price, $29.95.

Satellite Tracking *QuikMac.* AMSAT, P.O. Box 27, Washington, DC 20044. Price, $40 for AMSAT members; $50 for non-members. Requires Microsoft BASIC.

Satellite Orbit Prediction Program. Macintosh conversion of W3IWI program. Earl Skelton, N3ES, 6311 29th Place NW, Washington DC 20015. Send formatted 800K Macintosh disk with stamped, self-addressed return disk mailer; or send SASE for source listing. Requires Microsoft BASIC.

MacSat. BEK Developers, 1732 74th Circle NE, St. Petersburg FL 33702. Price, $10.00.

MacSat 3.0. Geodetic Research Services Ltd., P.O. Box 3643, Station B, Fredericton, N.B. E3A 5L7, Canada. Price, $50.00 (add $10.00 for airmail postage and handling).

Satellite Helper. MacTrak Software, P.O. Box 1590, Port Orchard WA 98366. Price, $59.95.

Satellite Pro. MacTrak Software, as above. Price, $99.95.

Propagation, Gray Line, DX Headings *DX Window.* Creates on-screen an azimuthal equidistant projection (great circle) world map centered on your QTH, with day/night terminator. Engineering Systems, Inc., P.O. Box 939, Vienna VA 22183. Price, $39.95.

Skycom 1.1. Enter solar flux and get propagation predictions to desired areas of the world. Engineering Systems, Inc., as above. Price, $39.95 ($59.95 with Skycom 1.5).

Skycom 1.5. Provides sunlight status at both ends of the path; MUF, F0F2, and FOT frequencies; S/N ratio of the link, and other information. Engineering Systems, Inc., as above. Price, $39.95 ($59.95 with Skycom 1.1).

DX Helper. MacTrak Software, P.O. Box 1590, Port Orchard WA 98336. Price, $34.95.

Sun Clock. Desk accessory. Displays a map of the world with day and night areas. MLT Software, P.O. Box 98041, 6325 SW Capitol Highway, Portland OR 97201. Price, $17.00.

Radio Control *ICOM IC-735 Control.* KE6FG Software, 9763 Pali Ave., Tujunga CA 91042. Price, $49.95.

Test Preparation *Ham Stacks.* HyperCard stacks containing all of the questions in the current question pool for each license class. Diana Syriac N1GZS, 49A Meadow Pond Drive, Leominster MA 01453. Send two formatted 800K Macintosh disks with stamped, self-addressed return disk mailer. Also available via anonymous FTP from the pub/ham-radio directories on apple.com and platypus.uofs.edu.

Collections and Miscellany *MacNet.* Public-domain programs (currently on nine disks) contributed by Macintosh packet users. Includes test preparation, contest logging, propagation prediction, satellite tracking, and amateur television. John D. Seney KB1HE, 144 Pepperidge Dr., Manchester NH 03103. Send formatted 800K Macintosh disks with stamped, self-addressed return disk mailer. Contributions of public-domain programs encouraged.

"Project Mac." Contest logging, antenna design, satellite tracking, clip art, etc. Microsoft BASIC required for many (but not all) of the programs.

Stan Horzepa WA1LOU, 75 Kreger Drive, Wolcott CT 06716. Send three formatted 800K Macintosh disks with stamped, self-addressed return disk mailer.

Amateur Radio Software for Macintosh. Extensive catalog including logging, Morse code, Novice, gray-line, satellite tracking, contesting, packet, and CW programs. ZCo Corporation, P.O. Box 3720, Nashua NH 03061.

Amateur Radio #1. Contains satellite tracking, Morse code practice, Ohm's law calculator, and pad design programs. Kinetic Designs, P.O. Box 1646, Orange Park FL 32067. Price, $4.00.

Red Ryder 9.4. Terminal emulation program, suitable for packet radio. Kinetic Designs, P.O. Box 1646, Orange Park FL 32067. Price, $4.00.

MacScience BBS. Various ham-related applications, including antenna design, propagation, WEFAX, packet, and Morse code. Tel. (408) 866–4933.

Digikron Systems BBS. Various ham-related applications, including logging, propagation, Morse code, and packet. Tel. (408) 253–1309.

WB3FFV BBS. Various ham-related software, including packet, contesting, and Morse code applications. Tel. (301) 625–0817, 625–9482, and 625–9663.

N8EMR BBS. Varicus ham-related files, including packet, Morse code, DXing, and contesting software; AMSAT bulletins; and several ham newsletters. Tel. (614) 895–2553. Also available on AMPR.NET at 44.70.0.1.

Tandy Color Computer Software

List compiled by N1ENA, last updated 1/15/91.

CoCoPACT (for 64K CoCo1 or CoCo2) and CoPACT3 (for CoCo3). Monty W. Haley WJ5W, Rte. 1, Box 210-B, Evening Shade AR 72532-9735. Mike purchased this package about a year ago and it came with free PBBS software. Both programs have split screen operation, 40k QSO buffer, 10 macros, and an editor for off-line use. CoPACT3 (for CoCo3 only) uses 80-column display, additional 24K buffer, and optional 2400 baud serial port data rate. Price, $21.95 postpaid for both programs.

CoCoPacket. Brian Carling, 5131 Raywood Lane, Nashville TN 37211. Mike never tried this program. It's mentioned in the packet software list on page 5-5 of the ARRL's *Your Gateway To Packet Radio* book. Price unknown.

SMARTY2 (for CoCo3). James A. Sanford WB4GCS/NNN0HDF, 20 Glen Forest Drive, Hampton VA 23669. This is a RTTY program for the CoCo3 with an external terminal unit. It has split screen, SELCAL, several Baudot speeds and 300 baud ASCII. Mike bought this one about two years ago. Price, $15.00.

BBS: Thermal Fusion BBS. Greenville SC. (803) 862–7544, 300–9600 baud, 8N1. This is a free Ham/OS9 BBS with CoCo ham radio programs posted on it.

My sincere thanks to Patty Winter N6BIS and Mike Nadeau N1ENA for the information presented this month. No doubt there are more such programs "somewhere out there." And as you, the loyal readership, let me know about them, I'll be sure to share the information with the rest of you! Meanwhile, I've got more goodies on tap for next month, so don't miss that edition of "RTTY Loop"! 73

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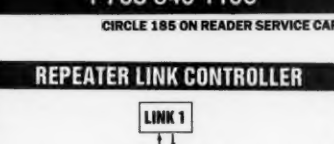

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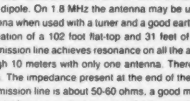

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T-Hunting Stolen Cars

Radio direction finding (RDF) began as a way of finding the position of ships during World War I. The first transmitter hunters were sailors. Then the military put it to work locating aircraft and, as a result, RDF played a vital role in World War II. Later, search-and-rescue crews, the FCC, and ham radio operators discovered its usefulness.

Now, RDF has become the latest tool of local law enforcement. Peace officers across the country are learning to T-hunt, and they're excited about it.

In 1978, an entrepreneur named Bill Reagan wondered if RDF technology could reliably locate stolen cars and hijacked eighteen-wheelers. He and Sheldon Apsell, an engineer and radio ham, developed the concept and called it "LoJack ™," to contrast with "hijack."

It took five years to design the equipment, and another two years to prove the feasibility of a wide-area RDF dragnet to authorities in their home state, Massachusetts. Test hunts of 800 simulated stolen vehicles had a 100 percent success rate, averaging 11 minutes homing time. In July 1986, the system became available to the public. Today there are 300 police cars with DF units, and 70,000 vehicle transmitters, in Massachusetts.

LoJack expanded into southeast Florida in 1988, then into New Jersey and southern Michigan. Southern California went on line last summer, and Chicago four months later.

The new Southern California Stolen Vehicle Recovery Network (SVRN) represents a $1.7 million investment for LoJack. The company donated the SVRN computer software and police RDF units. But the investment should pay off well, because the SVRN could take a big bite out of the auto theft industry here.

Over 129,000 vehicles are stolen in Los Angeles County every year, which works out to one every four minutes. Average loss per theft is $6,000. With an extensive ad campaign on television and in new car dealer showrooms, LoJack hopes to install 20,000 transmitters in the first year of business here, and expand the SVRN to other Southern California counties.

Cops Turn On the T

To prevent false alarms, the LoJack unit (LJU) is independent of any other alarms in the car. The transmitter is turned on only by police, and only after the owner reports that the vehicle has been stolen. The whole process is automatic.

When police routinely enter a vehicle into the CLETS state-wide stolen vehicle computer system, the information is transmitted to the special SVRN computer at police headquarters via a 9,600 baud landline link. The SVRN computer checks its data base to see if there is a LoJack match to the stolen vehicle's ID number. If so, Sector Activation Transmitters (SATs) broadcast a coded message to the LJU, causing it to start transmitting once every 15 seconds. The entire activation process takes about a minute.

Seven SAT sites ringing Los Angeles County, with 300 watts ERP at each site, insure that the LJU will be activated, unless the thieves have driven it into an RF screen room. The activation code is sent twice, five minutes apart, then repeated every half hour for good measure.

To save power and to prevent interfering with any DFing in progress, the LJU goes into a low duty transmit mode when the vehicle is first reported stolen. When the car's transmitter is first heard by a police cruiser, the officer radios headquarters, giving the five-character code from the RDF display. The linked computers respond with the vehicle ID and description, so the officer knows what he's DFing.

This inquiry also causes the SATs to broadcast a "query mode" message to the LJU. That increases the transmit rate to once per second, to speed up the homing process. After the vehicle is recovered, the computer tells the SATs to deactivate the LJU, and reset it to be ready for use again if needed.

The police need not know if a stolen car has LoJack when they enter it into the CLETS computer. The SVRN computer does not alert police when it sends out an activation. A LoJack T-hunt doesn't start until the signal shows up on the RDF set (called a PTC) in an officer's vehicle. At that time, the officer knows he is only a few miles away from the hot car.

Hundreds of Hunters

It's hard for a thief to elude the system: 465 police and sheriff cruisers in Los Angeles County have PTCs. That's over 50 percent more than in Massachusetts, even though Los Angeles County is one-third the size of the Bay State. Installations are being planned for police helicopters and boats, too. All but one of the law enforcement agencies in Los Angeles County are participating in the program.

Micrologic Corporation makes the PTCs, which use "pseudo-doppler" technology in the VHF "high band," between 150 and 174 MHz. The electronically-rotating antenna array has four whips, in a square pattern, on the squad car's roof. The display unit (see the photo) resembles the commercial VHF Doppler RDF sets for sale to hams and mariners. It has a 16-LED direction indicator, S-meter, and five-character readout.

The PTC is more sophisticated than a typical Doppler RDF set. It gets a bearing on each transmission burst, holds it, and displays the code of the vehicle on the five-character readout. All activated LJUs transmit on the same frequency. Officers can get bearings on more than one car at a time, distinguishing them by their unique codes on the display. To prevent confusion when closing in, the PTC can be locked to display bearings from only one selected LJU.

The LJU, built by Motorola, is the size of a chalkboard eraser. It is mounted in the vehicle in one of 35 inconspicuous places, randomly selected. Usually the owner has no idea where his LJU is. No warning stickers are put on the vehicle. That's good, because a significant number of vehicles are taken at gunpoint. It would not be good if thieves could force owners to reveal the LJU's location so they could destroy it.

Transmitters put out two watts, and draw only 400 mA when transmitting. If the thief tries to disable the LJU by disconnecting the vehicle battery, an internal sealed lead-acid battery will keep it on the air. Even if that battery runs down, the LJU will remember its mode (activated or not), and come up in that mode when the battery is reconnected.

Results Guaranteed

So, how are Southern California peace officers doing at T-hunting? Very well, thank you. Since the system came up on July 20, 1990, there have been 22 stolen vehicle activations. All cars were recovered within 24 hours. Average time was three-and-a-half hours. The fastest took only 14 minutes from the time the report was filed.

Two recoveries here resulted in busting large theft rings. Arrests were made in a quarter of the Los Angeles cases, which is typical for LoJack pursuits. The national average for non-LoJack car thefts is arrests in only 5 percent of the cases.

Auto theft has gone down 9 percent in Massachusetts, and some insurers there offer lower rates to LoJack-equipped vehicles. About 4.5 percent of all new cars sold in that state get equipped with LJUs.

LoJack was careful to design a system that is as reliable as possible, and stands by it with a two-year warranty. The company will refund the LJU's purchase price if the vehicle is not recovered within 24 hours of being reported stolen.

Police like the system because it enhances their safety. All too often, police officers have been killed or injured in the line of duty when they unwittingly pulled over a stolen car. Officers know that a vehicle with a squawking LoJack unit has been reported stolen, and can take appropriate precautions when approaching it.

Of course, the LoJack system is not perfect. For one thing, the vehicle must be reported stolen before DFing begins. That's good because it prevents false alarms. But, if the owner doesn't discover the theft promptly and report it, the vehicle could be long gone. That's another disadvantage—the limited range of the dragnet. Doppler technology limits each squad car's tracking range to about five miles. The helicopters will do better, of course.

The company claims that short range isn't a problem, because of the large number of PTC-equipped police cruisers. Furthermore, thieves usually let stolen cars sit in a nearby safe place to "cool off" before driving them out of the state, or out of the country.

Perhaps, but one stolen Jeep in Los Angeles was recovered just two minutes before the 24-hour guarantee ran out. Apparently it had been driven 200 miles out of the area and back again.

Add to this the possibility of a slow-up due to down time at the CLETS statewide computer, and you have a system that is not foolproof. In Massachusetts, the recovery rate has dropped slightly every year, from 97.9 percent in 1987 to 94.4 percent in 1990. Still, that's an impressive record. It speaks well for the robustness of the LoJack system design and the DFing abilities of law enforcement officers.

Too bad the PTCs don't tune to two meters. I could use the help of 465 police cars on some super-tough competitive hunts. 73

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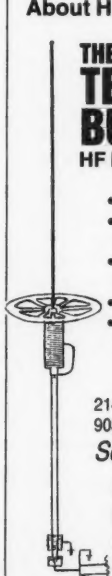

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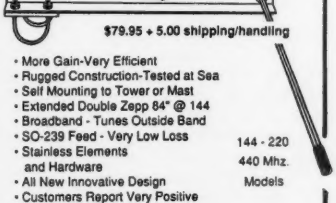

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WARNING

Don't be fooled by antennas that are also sold with a windom label. Most of them use a 1:4 balun. That balun will never work. You'll always need a tuner with those fake windoms. The laws of physics make sure that it doesn't work, despite what the manufacturer promises you. Honestly, why buy an antenna that needs a tuner to operate?

Here's Proof

Read what our satisfied customers wrote us about their genuine Garant Windom Antennas. All originals are on file for your inspection, as the FTC requires it. Fred, W8YFK: "I purchased one of your GD-9/2KW antennas. It works great. Nine bands, no external tuner. Who could ask for anything more?" Howard, W3HM: on his GD-9/2KW: "Service was fast. The antenna is first class. It does all it was advertised to do. Now, I have one antenna, one feedline and all (9) HF amateur bands for the first time in 27 years of hamming. The xyl likes that too." John, KA3SDO on his GD-8/500W: "Prompt delivery, helpful phone ordering and information, combined with a quality product. Garant truly has an unbeatable combination." Don, N01GE: "I am very pleased with the shipping speed, service and the GD-8/500W antenna. This is my only antenna for 10 to 80 meters. What a great performing antenna. I am very pleased." John, WOHBE: "I was extremely anxious to put my new GD-8/500W on the air. The instructions make the assembly fast and simple. I was impressed by the low SWR on all bands and comparison tests have proved to me that the Garant GD-8 windom is far superior to any other wire antenna." Paul, N1PL, on his GD-8/500W: "The antenna is dynamite on 20 meters." Charles, W9JLZ: "Garant GD-8/500W antenna performs very well on all bands. Great antenna. Get great signal reports." Michael, N8BED: "Order received promptly as promised. GD-8/500W works as promised, using your measurements. No trimming required." Herbert, WD9GBH: "My GD-9/500W works fine. Great multi-band antenna." For more letters with genuine call signs see our free data report.

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T/R Controller Relays

The last few months we've done a lot of building in this column! This month we'll tie up several loose ends. The two projects, the T/R controller and the universal transmitter, are both easy to build and get running. Very few components are critical. Your local Radio Shack store can provide most of the parts needed. However, herein lies the first problem.

The onboard relays used by the T/R controller have been discontinued from Radio Shack. However, some stores still have them until the stock runs out. Because the PC board pattern is designed to use this particular relay, nothing else will fit the board. Unless you happen to come across the same relay surplus! Of course, you could use a junk box relay mounted off the board as I have done. Just be sure the coil current is not more than the switching transistor can carry. Down the line, if there is enough interest and a suitable relay is found, the PC board may be re-designed.

Some readers complained that the sidetone will not operate. There is a simple fix for this problem. Be sure the sidetone-in and sidetone-out pins are connected together! If they aren't, the tone oscillator won't work. Speaking of the sidetone, you don't have to build both the sidetone and the relay switching if you don't need one or the other. If you need a sidetone generator and amplifier, just build that part of the circuit. To turn on the sidetone, just apply +12 volts to the sidetone-in pin.

If you plan to operate the complete T/R controller with a transmitter, such as the universal transmitter, make sure you operate both the T/R controller and the transmitter from the same power supply.

As I noted earlier, a large battery bank supplies all my power. All my equipment is operating from this source. There is no problem using the controller this way. However, if you operate the T/R controller from a +12 volt supply, AND the transmitter from a DIFFERENT +12 volt supply, things may not work correctly, or work at all. The fix is simple. Just be sure that all devices are operating from the same +12 volt source.

That should reduce any mistakes and provide you with a working T/R controller in no time. Remember, FAR Circuits (18N640 Field Court, Dundee IL 60118) can provide PC boards for both the T/R controller and the transmitter.

The Universal Transmitter

The universal transmitter contains some gray areas, also. The following hints should help clear things up.

The oscillator will work with just about any crystal. There are no tuned circuits in the oscillator. VXO operation is possible, but I've had some really strange results with the crystals I've been using. On 30 meters, I've gotten about 5 kHz worth of swing. As I discussed in an earlier column, almost all of the frequency shift is bunched up on one end of the VXO capacitor.

"Signal reports ranged from 529 to 599; you CAN'T be QRP!"

My crystals came from Jan Crystals. They are in the HC-25/U holder and have a 20 pF load capacitance. I ordered a new set of crystals from International Crystal, hoping to get a different VXO swing. I ordered AT cut, fundamental crystal in the HC-6/U holder with a load capacitance of 30 pF. The crystal's frequency is 10.106 MHz. In the VXO, I used a 365 pF variable capacitor. I'm not really sure of the exact value of the capacitor, since it came from the junk box.

With the new crystal in the circuit, VXO swing was still only 6 kHz. I tried to add some inductance, but did not see much improvement. I took the same crystal and installed it in a different home-brew transmitter, using a different oscillator scheme. OHMYGOSH! Did I ever get a surprise. With the crystal in the second VXO, I had a frequency swing of 10 kHz, from 10.102 to 10.112.5 MHz. The VXO should not have moved the crystal's frequency down, but it sure did. In the universal transmitter, the VXO swing is upward in frequency from 10.106 to 10.110 MHz. Leave the 0.01 feedback capacitor in the circuit even if you plan to add a variable capacitor to warp the crystal's frequency. You might want to experiment with different values of feedback capacitors. Then let me know the results of your tests, and I'll put them here in this column.

Construction of inductors L4 and L5 need some clarification. Make the wire leads coming from L4 and L5 a different length so that it will be easier to tell which is which. Coil L4 is in series between the collector of Q3 and the 22 ohm resistor. You can check this out quite easily by making sure the collector of Q3 has +12 volts applied to it when the key line is grounded. If you have no voltage on Q3's collector, you've gotten your wires crossed.

Coil L5 is a bit easier to check. One end of L5 goes to the junction of Q4 and the 47 ohm resistor. The other end of L5 goes to ground. With an ohmmeter you should see zero ohms from this point to ground. If you see 47 ohms, you're reading the 47 ohms from the resistor to ground, and coil L5 is then incorrectly wired.

30 and 40 Meters

I was working on a version of the transmitter one night for 30 meters. I didn't have all the correct capacitors, though, so I changed the output filter to suit what I did have.

Use these values for 30 meters. L1 and L2: 12 turns #22 on a T-50-2 core. Jumper the pads used by L3. Instead of the 330 pF cap, use 270 pF. Instead of the 680 pF, use a 560 pF capacitor. Omit the second 680 pF capacitor. Install the second 270 pF capacitor on the antenna side of the filter. You end up with two cores and three capacitors.

For 40 meters you can use the following: L1 and L2; 14 turns #22 on T-50-2 core. Replace the first 300 pF with 470 pF. Jumper the pads used by L3. Delete the second 680 pF capacitor. Replace the first 680 pF with 1000 pF (0.001) and the last 300 pF capacitor with 470 pF. Use silver-mica capacitors in both filters for best results.

Since I don't have crystals for 14 MHz, I did not work out the filter values needed for that band.

If Radio Shack is out of stock of the 100 µH RF chokes, wind your own. Use ten 10 turns of #28 on FT-50-43 core.

The final might be hard to locate. I still have a good supply of hamfest PAs lying about, and that is what I used. If you can't find the part listed, try one of these: RCA 4013, 2N3553, and 2SC2075. Also try the more readily available 2N3053 and 2N3866. Just be careful, as the 2N3866 might become unstable if the leads are too long. Keep the leads short, ¼ inch from the board, and you should have no trouble.

That should clear up any loose ends on the transmitter. I've worked all up and down the East Coast on 30 meters using this little rig. The West Coast and DX are easy prey late into the night on 30 meters. Signal reports ranged from 529 to 599; you CAN'T be QRP! I know you'll find a spot for this project in your shack.

Since the U.S. postal rates have just gone up, letters without an SASE will go unanswered. Sorry about that, but the postage really cuts into my Diet Coke fund. If you don't want to communicate via the mail, try one of these. Via Compuserve, ID# 73357,222. America OnLine, Michael1087. Delphi, QRPER. I forget what my ID number of Prodigy is, but I'm on that service also. You can also reach me via packet: WB8VGE @ KA8Z BBS. Whoa! It's 1991. One can't live by CW alone! 73

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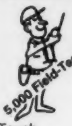

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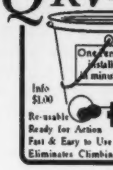

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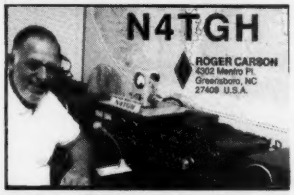

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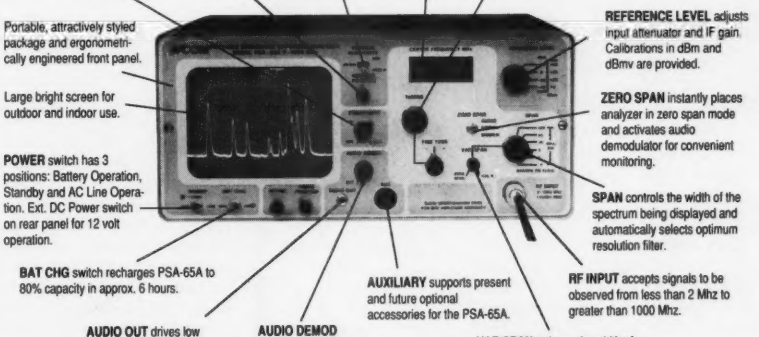
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Letters, Letters . . .

Lots of letters have been coming in, so perhaps now is the time to respond to some of them, and to cover a few interesting topics along the way.

Mick W6FGE asks whether there's any point to expensive, wide-audio bandwidth mikes since the radio cuts everything above about 2.4 kHz off anyway. Well, Mick, it's a good point. A mike with response out to 20 kHz is certainly wasted in amateur communications work. What makes some of the more costly mikes worth their prices is their response *within* the transmitted bandwidth. You'd be surprised how much variation there is between different mikes. The best ones for SSB are dynamics or ceramics, which have a rising frequency curve that adds "punch" to the voice, and helps you to get heard through the inevitable QRM. But the shape of that curve, and the frequency at which it peaks, can really affect the sound. Conversely, the best mikes for FM tend to be condenser mikes, which have a fairly flat response. The cost of a mike is not directly related to its sound. In fact, I've heard some really cheap mikes which sounded great, and some expensive ones which were only so-so. But, some higher-priced units are distinctly crisp and great on the air. The obvious way to find out is to try them. A cheaper alternative is to ask stations you QSO with what kind of mikes they are using. Don't just ask the good-sounding ones—find out which bad ones are out there, too. As for headsets, I have found that common "walkperson" units have far better fidelity than is necessary. They do fine for radio work, unless you need to shut external noise out, in which case you need the around-the-ear kind. As you point out, expensive hi-fi headsets are a waste.

On the subject of audio fidelity, Peter W1UO responds to my "Why Rigs Sound The Way They Do" column and relates his experiences with "hi-fi" SSB. He says that he once worked for the Voice of America, and they used HF SSB for their overseas feeds. Several fidelity-enhancing techniques were used, including diversity reception, phase-locked exalted carrier detection and wideband (6 kHz) SSB filters, each about the size of a loaf of bread! (Wow—imagine the size of a '940 with filters like that!) He says that overseas signals sounded like local FM broadcasts! See, folks, I told you so!

Guillaume K@OKP asks whether AM is permitted on the 220 MHz band. Let me check my ARRL handbook. . . Yup, it sure is. Unless they've changed that since 1985 (OK, OK, I need a new handbook), and I haven't heard of any such change. I doubt, though, that you'll find too many people to talk to up there on that mode. FM is the popular mode these days, with SSB and CW used for weak-signal work. But hey, give it a try, you never know.

A 17-year-old ham named Sean (no call on the letter) says that someone stole his TS-430S (*shame* on them!) and he can't afford another one. He has a digital shortwave receiver and wants to know if he can use its local oscillator to drive a preamp and power amp to make a simple transmitter. Sean, I'm afraid it just isn't that simple. In a superheterodyne receiver, which virtually all modern sets have, the local oscillator does not run at the frequency you are receiving! There is a rather large frequency offset, and that offset depends upon the first IF frequency. For instance, if the first IF is at 10.7 MHz, the local oscillator will be either 10.7 MHz higher or lower (depending upon the receiver design) than the frequency to which you are tuned. The only ways I can think of to get the frequency you want would be to design a mixer and inject another local signal to shift the frequency, or to reprogram the frequency on transmit so that it is in the right place. Either would be a great deal more trouble than it is worth. And there are other problems, such as stability, purity and signal level. All in all, consumer shortwaves just don't have what it takes to make decent ham rigs. A far better alternative would be to buy a cheap older transceiver at a hamfest and use your time and ingenuity to fix it up. In the end, you will be much happier with the results. And, you won't risk ruining your shortwave in the process.

Kenneth KA8RUA describes his frustration at trying to get schematics and service data for telephone gear such as cordless phones and answering machines. He asks whether it is legal for the manufacturers to withhold such information. Well, as far as I know, there is no law requiring them to give their data out. And I, too, have run into this brick wall regarding a broken answering machine. I suppose there could be some law prohibiting the general public from tampering with equipment connected to the phone lines, but I don't think so. I know of at least one major manufacturer that sells service manuals for their telephone gear. So perhaps the others are just being pigheaded and greedy, hoping you'll buy another unit or send yours in for an expensive repair job. I agree, it stinks. Let's be glad the ham manufacturers have more sense than that!

Dean KF7CR asks several questions, including some already covered in previous columns. But let me give them a whirl. Dean, PLL works by generating a stable digital pulse at a required frequency and then voltage-controlling an analog sine-wave oscillator until it matches the digital reference. The result is a programmable, crystal-accurate local oscillator. Because it's a two-way process (controlling the oscillator and then comparing its output frequency), it is by definition a loop. Hence the name, "phase-locked loop." And yes, your pocket digital shortwave works that way. For a more detailed explanation, please see my column in the March 1990 issue of *73*.

Packet radio is, as you guessed, a form of BBS over the air. It is also many other things, including a nifty auto-forwarding system which lets you place a message on your local BBS and have it delivered in a day or two at a very distant BBS, with no transmission errors. It is called "packet" because the data is transmitted in groups of characters, or packets, with each packet automatically including the originating callsign (yours), the destination BBS and callsign, and error-detecting codes. During packet reception, any detected errors cause the packet to be resent until it is received intact. There's lots more to it, but that's the basic idea. Packet is very useful and fun, especially if you have ham friends in other states or countries, because you can keep in touch without having to be on the air at the same time they are! Get a TNC and try it out! If you already have a 2 meter rig, even a walkie, it is fairly inexpensive and definitely worth it.

As for your noise suppression problems, I think some of them may be very difficult. Dimmers and fluorescent lights generate fast-rising pulses which are just plain stubborn. You are probably best off replacing them with regular switches and incandescent bulbs. As for your VW Rabbit ignition noise, wow—that is the worst I've ever heard of. Since the car eats ignition cables in 5,000 miles, I suspect you have a real problem. Perhaps the ignition resistor relay is stuck. That would allow full starting current to flow even after the engine is running. I had a car with this problem once, and it ate points as fast as yours eats wires. Your high voltage must be *way* too high.

Also on the subject of interference problems, **Winston KB6DHB** asks for help because his rig gets into his TV and stereo speakers, and even a low-pass filter hasn't helped. From what you describe, Winston, it sounds like plain old overload. Too much RF is getting into the TV and stereo. A low-pass filter only helps if the problem is harmonic output from the transmitter, and does no good at all for simple overload. Check to see if the TV gets interference on all channels from 2 to 6. That's a good clue. If it 's only channel 2, it could be harmonics. Even with the low-pass filter, some small amount of harmonic energy could be escaping. Also, your G5RV antenna is inherently unbalanced, because one leg is longer than the other. Try a balun at the antenna, or go to a standard dipole. Perhaps that will help keep RF from crawling back up the coax shield. You could also try a line filter, but try disconnecting the TV antenna or cable feed first. If the problem goes away, the interference is getting in from the antenna input, and a line filter will do no good.

Finally, a prospective ham named Robert asks how we get meters from hertz, as in the 20 meter band being on 14 MHz, etc. Well, first let me state that the meter band designations are only approximate, and can never be exact because they are describing more than one specific frequency. But it works like this: For any given frequency, a wave will have traveled a definable distance before its next peak occurs. Thus, the resulting wavelength will get shorter as the frequency goes up, because the wave doesn't have as much time to travel before the next one comes along. The wavelength can be calculated and expressed in meters, feet, or anything you like. A simple conversion from time units (MHz) to distance (meters) will do the trick. The formula is: wavelength in meters = 300/frequency in MHz. The 300 is called a "conversion factor," and is required to relate seconds and meters. As for your other questions regarding the best choice of equipment and proper operating procedure, go visit your local ham club and you will get more advice than you probably want! (We hams *love* to talk about that stuff.) Also, there are some good books available from the ARRL and other organizations. And, of course, don't miss the great product reviews in *73*!

Well, folks, that's about it for this month. Keep them cards and letters coming. But please, save your stamps and return envelopes. It is very rare that I can send individual replies—there's just too much to do. Thanks for your understanding. 73

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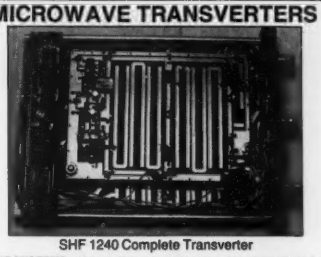

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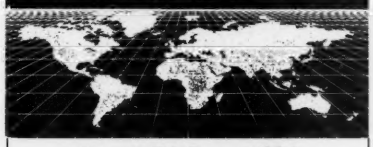

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Never Say Die

Continued from page 4

palace. I've sat in Geneva representing the U.S. at a world conference. I've addressed the FCC commissioners in hearings. I've helped a youngster in Burma find a wife in Singapore and settle in the U.S. I've visited Father Moran in Nepal. I've helped a ham I met in Yugoslavia move to the U.S. Ditto a French ham. No, I'm not bragging, I'm telling you what *you* can do. I'm telling you what the youngsters you mentor can do.

You're a ham! Through amateur radio you can learn about FM, sideband, spread spectrum, computers, digital audio, digital communications, television, slow-scan, RTTY, satellite communications, antennas, feedlines, gates, memory chips, synthesizers, telephone switches, facsimile, radar, LORAN, underwater sound, moonbounce, meteor scatter, aurora communications, and what people are like in around 400 countries.

Whenever I see a picture of the big dish at Arecibo I remember climbing up into it with Sam W1FZJ. And I remember being part of the team that used this 1,000-foot dish to make 1200 MHz ham contacts all over the world.

The real key to what we are going to do when we grow up lies in learning. If we use our time well, we'll be ready for whatever opportunities the world presents. Like Alfie, the world presents opportunities and they are lost due to our blindness to them. I'd already been exposed to technology through my grandfather, who was an inventor, so I was able to confidently tackle learning about radio.

Are you daunted by packet? By satellite communications? Perhaps, no matter your age, it's time to be adventurous and become an expert in a new aspect of the hobby. We need pioneers, even if they need walkers to get around. Even if you're 80, you still have a lot of growing to do. It's not too late to plan what you're going to do when you grow up.

And once you have some perspective on life, maybe you can share what you've learned with some youngsters. Teenagers need mentors. Their parents seldom have enough dispassionate perspective to help. So that leaves you. And if you do mentor some youngsters, are you going to be passing along your beliefs and prejudices, or can you give them some straight dope which will really help them cope with their lives?

You remember what teachers were like, so you know how little help they can be. You may even remember about parents. And you're seeing the values today's television provides. Some guidance! If you believe TV, all techies are nerds and geeks. Great role models.

In addition to giving talks on entrepreneuring at colleges I also enjoy talking with 5th graders and helping them see some hints as to the possibilities they've got. And I'm mentoring some college students, too. I only wish there was a medium where it would be possible to reach kids with some unbiased information on how the world works and how they can not just cope with it, but also help improve it during their tenure.

As for me, I've never had any illusions about my growing up. It's never been a goal. Now I find that's par for creative people, so I guess I don't feel as defensive as I did when I was a kid about making the world conform to me instead of my conforming to it. World, shape up, and get a move on, I haven't got all day!

Are you doing your homework? Are you reading magazines and books, talking with people, building things? Where were you in 1975 when microcomputers came along? Where were you when I was preaching computers? I was 53 then. Did I face this whole new technology and give up? No way! Within a year I was giving lectures on computers to computer professionals. Sure, I did a lot of homework. I still meet people who took my advice at the time and got into computers. Some became fabulously rich. Some didn't. But everyone enjoyed what they were doing.

We have similar opportunities today with direct satellite broadcasting, high definition TV, digital audio, digital TV, digital signal processing, personal telephones, data compacting... it's an endless and exciting world ahead in technology. And amateur radio is the key to this world for youngsters.

Are you learning and teaching? Are you mentoring? Or are you grousing about no-code, how bad things are on our bands, and being in general a useless negative curmudgeon? Sure, I see the problems, but I love problems because they call for creative solutions. The fact that you are allowing a few idiots to screw up 14.313 every day and do nothing more than wring your hands about it is pathetic.

Sure, it takes confidence to see a need and actually do something about it. That's what got me into publishing in the first place. I didn't know anything about it, but I knew I'd learn. And, as I mentioned recently, I'm still learning. I still go to publishing conferences and attend seminars. Much of the time I should be teaching 'em, but I know I've plenty more to learn.

That's what keeps me reading piles of magazines and a couple books a week, year after year. One whole end of my home is sagging under the weight of my library.

I love to learn about music, too, so somehow I manage to listen to a half dozen or so CDs a day. The music industry is fascinating and I'm having a ball with it. There are tremendous business opportunities in this field, too. Music and technology have merged, which is great for me.

And if radio and audio don't get you excited, how about becoming an electromagnetic expert and helping find out more about how EM fields affect living cells? You can get a download of references on the *73* BBS and see what I've read so far.

Are you ready to give a talk on the maglev? On NMR? Are you game to help some school classes learn about electronics and communications, if I can get our schools to set up these courses? Or are you spending your declining years pontificating on 75m? Or adding to the pile-ups on 20m?

Ooops, my soapbox is beginning to come apart.

When I Grow Up... Part II

Amateur radio may be a great key to learning about technology, but how many of us leave the key in the drawer and don't use it? I'd like not only to get you to take that key out and start opening doors for yourself, but to give copies to youngsters so they can open doors and open up their lives. I know what an impact it's had on my life—how about you? Any chance of your writing to me about it?

The opening doors are entries to learning possibilities. How can we learn? How do we educate ourselves to take advantage of amateur radio's potentials?

In retrospect, I think I learned less during my years in college than I have in almost any year since then. My college wasn't set up to really teach. It was geared to students memorizing data in order to pass tests. I found it profoundly frustrating. This was why I've gone back to my college to try and help them become more productive and relevant. That's a whole story in itself, but I'm making progress—and so is my college.

I was out of college two years before I discovered self-teaching through reading. Since then I've built quite a library. I've probably averaged a book or two a week for the last 40 years, plus at least 25 magazines a week.

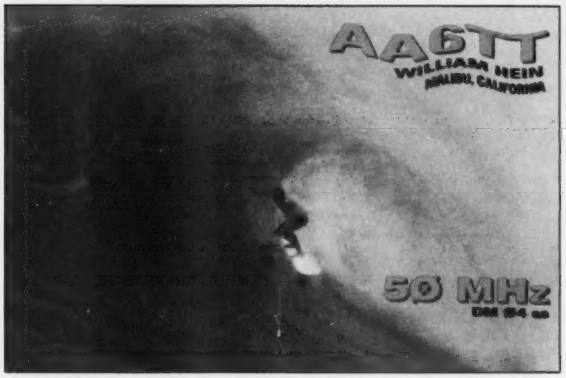
It's exciting to learn. Suddenly grasping a new concept brings a rush . . . a thrill. For instance, my recent adventures in digital audio have been fantastic—it's a whole new technology. Do you understand 1-bit technology? Why not? If you have the time to watch a basketball game, you have the time it takes to understand 1-bit technology. The ball game is soon over and forgotten. The understanding of a new concept will be with you for life. And yes, of course it can be important to amateur radio.

If we're able to keep some of our ham bands through the next couple WARCs, we're going to eventually go digital, complete with data compacting systems we haven't even thought of yet. Have you read much about data compacting technology yet? How about fractal math and chaos theory and their applications to communications?

For instance, you CW fans who are used to bleeping away at each other at a snail's pace, has it ever occurred to you to strive for more throughput? One creative approach might be to take the "Q" code concept to the next level of abstraction. A study of amateur communications will, I suspect, show that it'd be simple to develop a ham oriented "Pidgin English." We could encode the few dozen basic communications concepts we have settled into using into a simple code. Instead of sending "QSL?" we could substitute one 8-bit character for the four we've been using. Eight bits gives us 256 different combinations, so with just one character we could convey 256 different ideas. That's more than we use in a week of average ham contacts and it increases our throughput four times. This, in turn, will allow us to use only 25% as much bandwith, allowing four times as many QSOs in a band.

If you feel that's too limited then, heck, let's blow it right out to 16 bits and have 65,536 concepts. That's more concepts than I've heard discussed over the air in 20 years. But it would be a simple way to cover a wide range of ideas in a hurry and get beyond the "please QSL" contact limitations.

Several readers have written, asking how they can uncover mutual interests during contacts. Using our present system it ain't easy. How would I be able to find out if the chap I'm talking with is into skin diving? Photography? Cooking? Miatas? Gaia? Cosmology? UFOs? Macintoshes? South African folk music? Roller coasters? Or that he's been to Bali, Cairns, Xian, or Kota



QSL of the Month To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year Subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

Kinabalu? A bit of encoding could compress each of thousands of interests into one single 16-bit datum.

Upon making contact, the other chap could send his name and location, followed by a string of interest codes. It doesn't take much computer power to tell me which fits in with my interests. And off we go.

Of course if you really insist on making this compatible with smoke signal technology, we could stick to our typewriter characters and send them via Morse's code. With 26 letters and 10 numbers we have 36 characters at hand. Three characters would give us 46,656 combinations. Will that hold you? We could even call it a "Q-code" if we initiated the code groups with a "QQQ" starting sequence. I doubt that we'll be wasting spectrum space with Morse code for much longer—unless of course we keep our present bands and we are unable to generate any more growth than we have in the last 25 years, in which case we can continue happily with our antique communications modes for years.

Many years ago I suggested we build a 65,000-word dictionary and assign a number to each word. Then all we'd have to do is send a string of numbers and our computers would translate them into words again for us. This would increase our throughput by three times and allow us to narrow our bandwidths by that.

A couple of added advantages would be that this would, for the first time, allow foreign amateurs to talk with us via computer-translated messages. Also, if we want security all we have to do is scramble those 16 bits around in a predetermined way. At a 9,600 baud rate we could have a throughput of around 25,000 words per minute. A 400-word message would zip through in one second.

Let's say that I've piqued your imagination and you've decided that you are willing to take the initiative and learn about some new phase of amateur radio. How are you going to go about it? Well, if you have a solid set of *73* and *QST* back issues, you've got a good start. Then you'll want to look for specialized ham newsletters to take you to the next phase.

That's what got me into this whole publishing mess in the first place. I was enjoying RTTY pioneering and got fed up with the lack of information, so I started a newsletter in 1951. It's obviously gotten way out of hand.

Alas, only a few of the hams involved with developing new technologies have enough interest in helping others to bother writing, so information is not easy to find. In the early days of repeaters there were some marvelously well-developed repeater networks such as the Gronk Network, which provided instant communications from San Diego to San Francisco and all the way out to Phoenix. I pled with them to encourage other similar nets to be developed around the country by writing. Too much trouble. I tried everything I could to get them to write. Part of the problem was laziness, part a smug protection of what those involved had learned. An unwillingness to share with others.

If you'd like to help, there are some easy ways to do it. For instance, there are tons of electronics and communications books in print. Unfortunately, many are poorly written and are not nearly as helpful as they might be. So, when you find a book you think will help others learn about some aspect of electronics or communications, how about taking a few minutes to review it? If you can let me know what you've found, I can pass this along and everyone will benefit—and we may even add it to Uncle Wayne's Bookshelf.

By focusing attention on the better books, we'll help discourage publishers from flooding us with drek. And by helping the better authors to be rewarded we'll end up with more good books. Make sense?

One of the reasons I knew *Byte* was needed was that when I read the available computer books I discovered they were almost impossible to understand. Instead of putting this down to me being dumb, I decided it wasn't me and that the microcomputer, which had just been invented, would bring about an enormous demand for easy-to-understand information. So I started magazines to fill this need. Wow, was I right on that one!

I read a book or two a week. A few of them I would love to recommend. If you're interested I'll try to keep you abreast of my reading. This would be better via our *73* BBS than in the magazine since only a small percentage of my reading is ham oriented and I suspect that most *73* readers are interested only in amateur radio oriented books and could easily turn nasty if I suggest reading anything beyond this narrow field.

But let's just suppose that you are 20, 40 or even 60 and reading this. At 20 you're just getting started in life. You're probably about to graduate from college after 16 years of third-rate education. You are undoubtedly one of the more fortunate graduates in that you are able to read and you have an interest (hamming) which you can parlay into a career. Of course you're going to have to make a big decision. You're going to have to say, "Enough with all this school nonsense, I've got to start really learning."

Of course if you get sucked into wasting your life on non-career sidetracks such as politics, religion, and righting an almost infinite number of the world's wrongs; or you let peer pressure get you involved with drugs such as alcohol, cigarettes, and worse; or you get involved with watching sports events, others are going to quickly pass you by and you're going to have to be satisfied with being jealous of those with successful careers and angry at yourself for screwing up.

At 20 you can pick any branch of electronics and within a year become an expert. Or you can coast through life waiting for a lucky break or a state megabucks win. But since you're not going to be tuned into passing opportunities, you're going to miss most of 'em.

At 40 you're having to face up to how dumb you were at 20 not to invest your time more productively. This is when men make mid-life changes. It's your last big chance to get on a personal career path which leads somewhere. It's your last chance to shape up and get the education you were too busy to bother getting at 20. Well, I'm sure those hundreds of ball games you've watched will comfort you in your old age. . . which is now looming immediately ahead of you. Forty *is* middle age. After 40 it gets increasingly difficult to find work. And it's difficult to down-size your lifestyle if the axe falls and middle management at your company is suddenly cleaned out.

At 60 you're very unlikely to ever get another job. You're on your own now. Have you stored up enough money to coast the rest of the way, golf clubs in hand? Have you enough on the ball to make a living as a consultant?

At 60 you've got a good chance at 20 more years (unless you smoke), so there's still time to start from scratch and become an electronics expert in some field. I started over when I was 61. Well, yes, I had a little money put aside to scratch with. At 61 I picked an entirely new field and began to build a new publishing career in the digital audio and music fields.

In my early years I didn't really plan. I took what came, moving from radio to TV broadcasting, then to speaker manufacturing, with side trips into psychology and music. I think my first major career decision was when I was 38 and started *73*. I knew that was a long-term decision.

My second decision was, as I said, at 61. Both turned out to be good decisions. Today I have plans going out for the next 20 to 30 years—probably far beyond my life expectancy. I'm glad I learned to learn when I was 28—and regret the years I wasted before that.

It's no news flash that education is the key to success in any way you want to measure it. I'm not talking schools, because you can educate yourself far better and faster than any school I've seen or heard of. And you can have more fun doing this than watching football or hanging out at the mall. And that's at any age from around 10 until you finally get that coveted Silent Key award plaque.

If you haven't gotten into packet yet, that's both an easy and fun way to start expanding your technological horizons. Keep notes of your progress and let me know how it goes.

License Growth

The FCC numbers are in for 1990, and if you don't mind ignoring that the FCC doesn't take into consideration dropouts and silent keys any more (since 1984), we've had some growth. If you factor in lost souls and the Grim Reaper, it doesn't look all that wonderful.

If we don't count our losses and we compare the 1990 count against 1987, we find that in four years the number of Generals has grown a mighty 4.7%. Yep, in four years and not counting losses! It's no better for Advanced, which on paper has grown by 4.2%. Wow!

Well, how about Novices? No great number of deaths there, though we can expect heavy dropouts. On paper, in four years our Novice ranks have increased by 13.1%.

Correcting the presently completely spurious FCC numbers depends on how fast we're dying off. If the average ham age today is around 55, then on the average we've got maybe 25 years left before we get our coveted Silent Key award from the League. Let's see, 25 into the FCC total of 500,000 would give us a departing rate of around 20,000 a year. No wonder those lists in *QST* are so long these days! If that's true, and not even counting dropouts, we've barely broken even in the last four years.

Settling the Arab-Palestinian Problem

Oh, good Lord! Now Wayne's going to try and settle the unsettleable. Obviously there is no simple solution to the Arab-Israeli mess. Or to the problems in Beirut, Libya, Iraq and so on. Perhaps it isn't as difficult to come up with a long-lasting peaceful solution as everyone seems to think.

So what's this got to do with amateur radio? It actually does have a good deal to do with it, though I wouldn't let that stop me from writing about it, even if it didn't.

When I first visited Jordan in 1970, I'd already been writing about the critical importance of technology to the progress of a country in my *73* editorials for several years. Amateur radio, I felt, was one of the simplest ways of introducing technology to the public. Through a hobby such as amateur radio, where learning technology is made fun, I believed that youngsters could be encouraged to become technicians, engineers and scientists. One of the main goals of my 24-country, around-the-world DXpedition trip in 1966 was to see if I could get the ITU to embrace amateur radio as a means for developing an interest by youngsters in technology in third world countries.

My first step was to visit the recent ITU ex-Secretary-General in Addis Ababa and ask his advice on how to get the ITU to encourage the growth of amateur radio in third world countries. He loved the idea and said he would make arrangements for me to meet the new Secretary-General on my visit to New Delhi.

He was as good as his word, so when I got to New Delhi I had no trouble in meeting with the new ITU Secretary-General. He too liked my plan for getting amateur radio going in third world countries as a way to introduce youngsters to the hobby. . . and to technology as a result. I promised to provide a set of amateur radio rules and regulations for the ITU to recommend.

I had a wonderful time DXing from Beirut, Damascus, Tehran, Kabul, New Delhi, Katmandu, Singapore,

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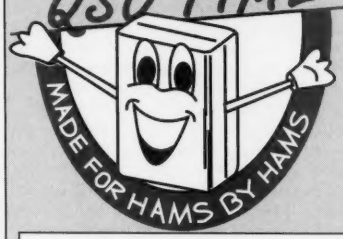

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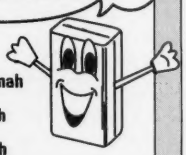

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Noumea, Suva, Apia, Pago Pago, Papeete and on around the world. When I got back I got to work on writing ham rules for third world countries. About this time the Secretary-General had a heart attack and died.

With amateur radio in the middle of the "Incentive Licensing" disaster, I was unable to leave my magazine and meet the new ITU Secretary-General. How bad was the hobby hit? 85% of the ham dealers had just gone out of business. 90% of the manufacturers had, too. My business manager stole all the money he could while I was on my trip and tried to put the magazine out of business so he could start his own magazine. It was a difficult time for me.

By 1970 I was finally able to get away from the magazine for a couple weeks, so when I heard that King Hussein was interested in amateur radio I saw an opportunity to give my third world country concept a try. I sent him a cable offering to help him with his new ham station. He said sure, come on over.

I spent two weeks operating JY1 from the royal palace and talking with His Majesty. I explained the benefits of amateur radio to Jordan. I pointed out that if he set up ham stations in his schools and encouraged Jordanian youngsters to learn about amateur radio, that in short order he'd have a bunch of enthusiastic electronic experts, technicians and scientists.

He gathered his government around a large table so I could explain the idea to them. I pointed out that if Jordan was going to fit into the modern world, it had to have technicians and engineers, and the best way to get them was to interest youngsters in a technical hobby such as amateur radio so they'd learn under their own steam.

When I got back home I updated my ITU amateur radio rules and regulations proposal, printed a few hundred copies on my offset press, and sent them to His Majesty. They used them pretty much as I proposed them.

Soon after I left Jordan a civil war broke out between the PLO and the Jordanians. Even though the country was in the middle of a civil war the school club stations were established and radio clubs formed.

In 1973, when I'd just finished a slow-scan QSO with a chap in Athens, a voice broke in on frequency, "W2NSD, this is Juliet Yankee One." It was His Majesty and he wanted to meet me in Washington in a few days. I met him at Blair House and was handed round-trip tickets to Amman. "I want you to see what you've done for us," he said.

When I arrived in Amman I was met by Hisham Ansari JY4HA, who proceeded to drive me from one end of Jordan to the other, introducing me to over 500 newly licensed Jordanian youngsters. They had set up one or two radio club stations in every city in Jordan.

Hisham had been appointed by the king to travel around the country to help the youngsters learn radio and electronic theory. His enthusiasm and teaching style had helped make learning fun for the youngsters.

They threw lavish parties for me and I got to meet all the top people in the government. I was a hero, at least for a few minutes. That was nice, but the real kick was that my idea had been proven. Now what could I do to get other countries to accept the idea?

Little did I know that two of the worst traumas of my life lay immediately ahead. I've shared those at length in my old editorials, so I'll save their retelling for my memoirs. By 1975 I was deep into computers, so it wasn't until 1983 that I had another opportunity to visit Jordan.

During that short visit, Prince Raad JY2RZ organized a special meeting of the Royal Jordanian Amateur Radio Society and introduced me as having had more of an influence on Jordan than anyone other than the king himself.

Okay, now let's dig into history so I can put the next step into perspective. Those of you who have any familiarity with history know that the Arabs were the world leaders a thousand years ago in philosophy, medicine, astronomy and technology.

The Arabs know this and it is galling for them to have been left behind by the industrial revolution and then, as a result, be exploited by the Europeans. It was technology that enabled the Jews to found Israel in 1948. They'd set up amateur radio stations all through Palestine while it was under British control. Then, when the British pulled out, these ham stations instantly became a military communications system that enabled the Jews to quickly rout the Palestinians. Indeed, amateur radio has been given a great deal of credit for the founding of the Jewish state.

The key to solving the Palestinian problem doesn't lie in distributing territory. That isn't going to solve the basic enmities which will continually erupt in confrontations. That isn't going to ease the frustrations that have built up for the last 43 years and that were exacerbated by the 1967 six-day war and the 1973 war with Egypt.

How About Japan?

Japan tried using their army and navy to gain power. We beat them with technology. Yes, we fought hard, but it was technology that won that war, not just fighting. I was right there up front in a submarine sinking Japanese ships (we sank 27 of 'em), so I know what an enormous difference technology made.

We were able to go unobserved right through the middle of Japanese convoys at night on the surface. I knew where every ship in the convoy was and every move they made, while they didn't have a clue we were there until our torpedoes started exploding all over the place.

After the war the Japanese figured out how critically important technology was and they went after it with a vengeance. Today they're far ahead of us (and the rest of the world) in many high-tech fields. Technology has made Japan #1 in the world in finance. It's enabled them to beat us (and Europe) in one industry after another.

Look at the difference technology has made in warfare. Iraq was outfitted with the latest in technology from France, Germany and the USSR, yet our weapons quickly knocked 'em for a loop. We were one generation ahead in technology and that made all the difference.

What Next, Then?

The solution to the Arab-Israeli problem, to the fighting in Beirut and to Syria's belligerence and all the other Arab infighting, lies in education. With education the Arabs will be able to come up to speed in technology and regain their racial pride.

"The solution to the Arab-Israeli problem, to the fighting in Beirut and to Syria's belligerence and all the other Arab infighting, lies in education."

One of the dumbest moves the blacks made in South Africa was that when they got mad at the whites, they pulled their children out of school. They stopped their education. Talk about shooting themselves in the foot! That just made a lousy situation all the worse, leaving an educational vacuum which could take generations to repair.

Now, back to Jordan. My suggestion is to start with educational programming on the Jordanian TV stations. These programs should be made so interesting that people will watch them because they're entertaining, not because they're educational.

In addition to everything normally taught in grammar school, I'd also include a course in the fundamentals of electronics, computers and communications. I'd encourage the youngsters to start electronic experimenter clubs, radio clubs, computer clubs, science fair clubs and so on. I'd encourage the youngsters to get together to help each other learn more about all kinds of scientific things.

If Jordan is going to cover everything, it'll take several TV stations, and the people will need VCRs to tape courses broadcast at inconvenient hours. Once broadcast, the tapes can be made available for home rental.

There is nothing at all the matter with Arab intelligence. They just need education and they'll give the rest of the world a good run for their money. The method I've described would provide this education at the lowest possible cost. It also wouldn't be held up for 10 to 20 years while new teachers are trained.

A few Arab countries have oil, but most have little more than their people as a resource. Educated, they can be the most valuable resource in the world. Uneducated, they are likely to be frustrated and thus easily gulled by fanatics. When we see screaming Arab mobs, we know we are not looking at educated people.

Japan has shown how it's done. We're learning many things from them. Perhaps the Arabs can too. Japan has well over a million licensed amateurs so far. The Arab countries, what, dozens? Outside of Jordan, I doubt it.

If they start teaching science to Arab youngsters we may start seeing hundreds of thousands appearing on our bands. Then, if we've decided to use amateur radio to actually talk with people instead of coercing QSL cards out of them for DXCC credit, we may finally have people-to-people communications and start building friendships.

Yes, I make it sound simple. I think it is. I'd like to see His Majesty King Hussein start providing education for his people and the nearby Palestinians in Israel. Then, via educational video tapes, Jordan can become the education center for the entire Arab world.

Science teaching will go much faster if the video courses are supported with good textbooks and science labs. I've some inexpensive, creative solutions to these needs too.

No, you can't force people to be educated. We've certainly proven that here in the U.S, where our compulsory system is a world class failure. But you can make it so much fun that kids learn because they enjoy it. And the more they learn, the more successful they'll be as a people and the wealthier their countries will become. And this can be done in one generation.

We've seen this in microcosm in amateur radio. No one forced us as kids to learn radio theory. We did it because we wanted to, because we enjoyed it. And the more we learn, the more potential we have for success in today's technological world. We are no longer tolerant of computer-illiterate people in our workplaces.

If we can get the Arabs hooked on education, who knows . . . perhaps we'll even be able to sell this radical idea here in the U.S.!

Am I suggesting that it's possible to turn nomadic goatherds into rocket scientists in one generation? Yep, that's exactly what I'm suggesting.

Since this is an editorial, not a book, I haven't gone into depth with my entire plan. I thought I'd mention that just to ward off the brickbats from negative people. Let me remind you that successful creative thinkers are positive. They tend to think in terms of solutions rather than problems. Is that the way *you* think? 73

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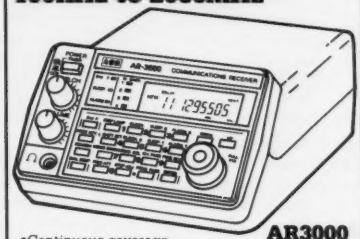

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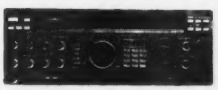

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YIG Sweeper

Last month I described the YIG (Yttrium Iron Garnet) oscillator and its internal construction. I also covered a sweep ramp generator, part of the YIG sweep oscillator project. This month, I'll finish the project with the drive circuits for the YIG oscillators. The sweep ramp generators tie directly into the driver circuits, providing both the YIG current control amplifiers and the oscilloscope with an external, horizontal drive, for full synchronization of both the YIG oscillator and oscilloscope.

The sweep ramp generator has controls for ramp symmetry and sweep length. The 1458 op amp operates from a +15 and −15 volt power supply. This is necessary because of the need for a wide swing between both power supply rails. Sweep ramp voltages for this op amp vary from +14 to −14 volts.

The power supply requirement is +15 volts at 1 amp. The negative supplies do not need to be high current regulators. Two are required: −5 volts and −15 volts. If your YIG is an HP type, you will need to add a −10 volt regulator.

Before I get into the drive circuit I thought I would provide you with some details on other YIG pinouts that I have run across. I don't know if you can locate the same type I have, but the information should prove helpful. For the Hewlett-Packard 2–6 GHz YIGs, power goes to a 14-pin DIP socket on top. Pin 1 is ground, pin 3 is +20 volts, pin 6 is −10 volts, pin 10 is the main coil positive terminal and pin 11 is main coil negative. The 3.8 to 6 GHz HP YIG pinouts are the same, with the addition of pin 14 being the FM modulation drive input pin.

John W7HQJ, who designed these driver circuits from multiple sources, is happy to share this project with the experiment-oriented amateur. The circuit is as simple as possible, while still making a very useful YIG sweeper/driver.

Circuit Description

Op amp U1a, an isolation amplifier in the sweep output, couples into the summing amplifier, U1b. U3a, another isolation amplifier, is in the voltage divider, the center frequency control. The high and low limit potentiometers there are relay-selected in each of the three different frequency ranges.

The details of multi-YIG switching aren't in the schematic. U2 and Q1 are the YIG driver current source, with Q1 connected as an emitter follower. This increases the current driving capability of U2 to the high values most YIGs need. The current limiting resistor in the emitter lead (25 ohms) is suitable for YIGs drawing about 180 mA. You need a 10 ohm resistor for 800 mA YIGs.

The comparator U3b serves as a fail safe should the operator turn the center frequency controls too high for the YIG. It samples the voltage on the wiper of the center frequency control, and when the voltage exceeds the desired threshold, it's directed to a high value current limiting resistor. Everything stops until the center frequency potentiometer is returned below this threshold.

Construction is straightforward. You can use perf board. In the future I may do a PCB layout for the circuit. It's my way of doodling in my spare time.

The leads for the YIG oscillator should have ferrite beads slipped over each end of the magnet driver coil leads. And, if you want to do CW operation, you need to put a large capacitor across the coil, to swamp out coil resonance. Keep the power supply leads short and well-bypassed. I usually grab a handful of 0.01, 0.1 and 10 µF capacitors, and sprinkle them around generously to minimize stray signal interference. It's a cheap fix. Rather than trying to find the lead that's making trouble, I bypass all the leads.

Mailbox Comments

The Ventura ARC wrote me of their latest laser QSO. Dick WA6JOX at Pumpkin Center and Steve WA6EJO at Mt. Pinos, California, 32 miles apart, easily pointed the laser at each other after determining accurate locations with 10 GHz "beam" headings. The laser receiver was constructed out of 4-inch PVC pipe with a front lens and a C7138 photomultiplier for the laser light detector. Dick stated that flashing spotlights in the direction the X-band signals came from helped, and he could easily see the bright light on Mt. Pinos; but the crew on Pinos had difficulty sorting out his spotlight from nearby city lights.

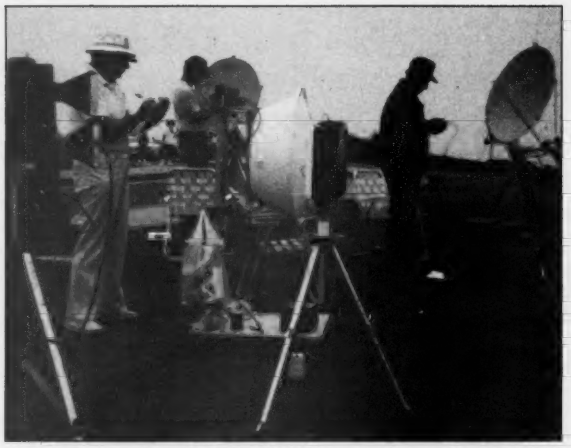


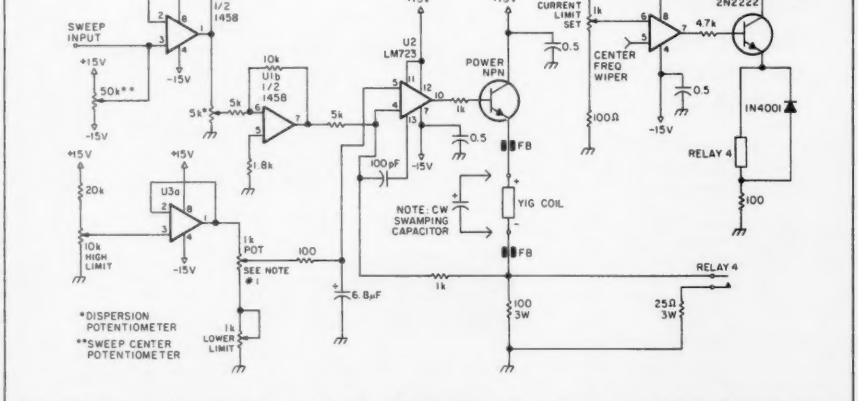
Photo A. Some members of the San Diego Microwave Group during the 1990 10 GHz contest on Mt. Soledad. Left to right: John WB6BKR, Kerry N6IZW, and Chuck WB6IGP. Photo by Bert K6BTO.

Aimed at each other, the lasers were bright even at 32 miles distance. Very little flicker from atmospheric disturbance was noted. The lasers used were 2.5 mW, HeNe (helium neon) which operate at a frequency of 474 THz, or, if you prefer, *474,000 GHz*! Quite an accomplishment.

Jack VE4JX is putting an IF and 10 GHz wideband system together using parts of an Alfa burglar alarm system. As microwave materials are scarce in Canada, he needed help obtaining parts. Using the *RSGB Handbook*, Jack is constructing a Gunn cavity.

Got to apologize to Paul KØIWA. I sent him a kit for the 30 MHz IF amplifier ("10 GHz Fun" in the April 1990 issue). The problem was I forgot to include the PC boards. Must have had toooo much sugar in my coffee that morning. By the way, Paul's call is especially great for an amateur living in IOWA.

Steven of Steven Coakley Video Microwave Services, referring to my August 1990 column, says it can be simple to receive commercial microwave transmissions. All you need is an SSB communications receiver. After tuning in, you demodulate the video output of the microwave receiver. A similar system is used in satellite communica-



Note 1: Center frequency control. You can select three YIGs for different frequency ranges by individually selecting them via relays along with different high and low limit pots. The schematic shows the hookup for just one YIG device.
Note 2: Relay 4 is normally closed. If the current goes too high (actuated by the comparator from the center frequency control) the relay drops out to provide a higher value of YIG current-limiting resistance.
Note 3: Bypass all IC power leads with 0.5 µF capacitors to ground.

Figure. The spectrum analyzer driver and out of range current limiter; John Petrich W7HQJ, 9/90.

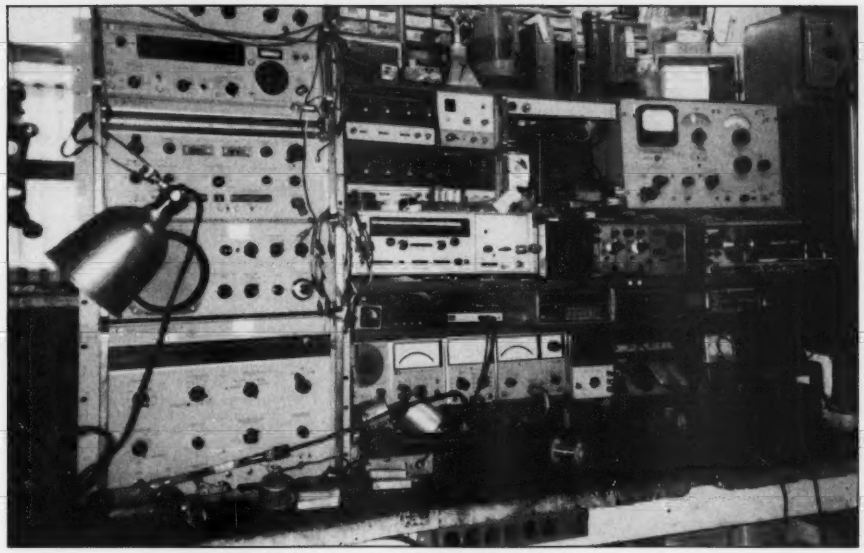


Photo B. WB6IGP's work bench, always cluttered, always changing.

tions to send long distance calls.

The video has all the SSB channels stacked from about 20 Hz to about 8 MHz. Steven suggests the book, *The Hidden Signals on Satellite TV*, by Thomas P. Harrington and Bob Cooper Jr., available from Howard Sams Publishing or through "Uncle Wayne's Bookshelf."

Well, Steven, if the signals are analog in nature, you can receive them. This scheme is used to transmit and receive microwave voice channels. I did a poor job of trying to explain analog and digital. Analog systems seem to be in decline, with most systems going digital. Digital format makes reception dependent on a digital terminal of similar type. There are test sets to do this, but none yet in surplus.

Myron KA9THG liked the switching power supply article in the August 1990 issue, and thanked me for helping him solve a problem. He had been looking for a simple way to run his printer on 12 volts DC. He had a bushel of old CB power supplies, and would you believe, the transformer he found is just what the doctor ordered—110 primary and 24 volts secondary. One thing: Watch out for spiking on the drains of the FETs. I used a series 0.1 µF capacitor and a 5 ohm resistor to minimize spiking. The formula for circuit frequency is TC = 4.40 times (R • C), or TC (60 Hz) = 4.4 • (38k • 0.1 µF). In actual tests, some variations in the capacitor suggest slightly higher values (+0.01 µF) to trim to proper frequency.

Alva KD4BH also wrote to me about this article, wondering why I didn't include a schematic. Well, Alva, I just forgot to send it in for that column. See the *Updates* section in this issue for the schematic.

That's it for this month. Next month, with the help of Steve WA6EJO, we'll explore laser communications. As always, I will be glad to to answer any questions related to our VHF/UHF microwave bands. Please send an SASE for prompt reply. 73's Chuck WB6IGP

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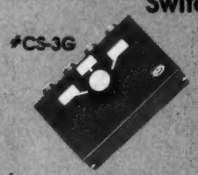

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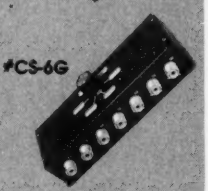

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SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check /HAMFESTS on our BBS (603–525–4438) for listings that were too late to get into publication.

MAY 4

OSWEGO, NY The Southern Tier ARC will host the Southern Tier Hamfest from 8 AM–4 PM at Marvin Park Fairgrounds. 32nd Annual Banquet, VE Exams, Flea Markets. Tickets are $3 in advance, $4 at the gate. Tailgating $2 extra; tables $15. Banquet (includes general admission) $18 per person in advance. Contact *STARC, PO Box 7082, Endicott NY 13760.* Talk-in: 146.16/.76 or 146.52.

CEDARBURG, WI The Ozaukee RC will sponsor the 13th annual Cedarburg Swapfest from 8 AM–1 PM, at the Circle-B Rec. Center, Highway 60 & County I. Advance tickets $2, $3 at the door. 4′ tables $3. Set-up at 7 AM. License exams start at 9 AM. Talk-in on 146.37/.97 and 146.52. For reservations and info, send an SASE to *ORC Swapfest, 11448 Laguna Dr., Mequon WI 53092. (414) 242–4995.*

BEMIDJI, MN The Paul Bunyan ARC will hold its annual Hamfest from 7 AM–3:30 PM at the Moose Lodge. VE Exams. Talk-in: 146.13/.73. For info call or write *Don Illies N0MAZ, R.R. 2 Box 187AA, Bemidji MN 56601. (218) 751–9254.*

MAY 4–5

ANDERSON, SC The Blue Ridge ARS will sponsor the Greenville Hamfest/Electronic Flea Market at the Anderson County Fairgrounds from 8 AM–5 PM Sat.; 8 AM–3 PM Sun. Walk-in license exams. Camping, free parking. Set-ups with advance registration. Advance tickets $4, $5 at the gate. For tickets, info, send SASE to *Blue Ridge ARS, PO Box 6751, Greenville SC 29606.*

SIERRA VISTA, AZ The Cochise ARA will hold its annual Hamfest at the club training facility, 5 miles east of town on State Rte 90, then 2 miles south on Moson Rd. All ham radio, computer and related businesses are invited. Free tailgating. VE Exams. Overnight RV camping for club members (no hookups). Facilities for the handicapped. Talk-in: 146.52 or 146.76 (–.6). Contact *N7INK (602) 378–3155* after 6 PM, or write to *CARA, PO Box 1855, Sierra Vista AZ 85636.*

MAY 5

SANDWICH, IL De Kalb Hamfest, sponsored by Kishwaukee RC, will be held at the Sandwich Fairgrounds, beginning at 8 AM. Set-up at 6 AM. Overnight camping, no hookups. Tickets $4 in advance with 2 stubs. After Apr. 15th, and at the gate, $5. Tables $10 each. Tailgate space free with paid ticket. Talk-in on 146.13/.73 and 146.52. For reservations, make check payable to KRC and send with an SASE to *Howard Newquist WA9TXW, PO Box 264, Sycamore IL 60178.*

ALEXANDRIA, VA Fairfax Computer Fair/Flea Market will be sponsored by the Thomas Jefferson High School for Science and Technology PTSA, in conjunction with the Capital PC User Group. The proceeds will go to benefit computer oriented education. This event will be held at the Thomas Jefferson High School from 9 AM–4 PM. Contact *Mark Bakke, (301) 530–1303* or *Mort Rau, (703) 754–9859.*

ST. PETERSBURG, FL The St. Petersburg ARC will sponsor a Hamfest at Lake Maggiore Park from 8AM–3 PM, rain or shine. Free parking. No tailgating. VE Exams from 10 AM–2PM. Admission $4, kids under 12 free. Set-up at 7 AM. For registration: *Otto Supliski WB2SLQ, (914) 969–1053.*

YONKERS, NY The Metro 70cm Network will hold a Giant Electronic Fleamarket at the Lincoln High School from 9 AM–3 PM. Free parking. VE Exams from 10 AM–2 PM. This is one of 3 Giant Electronic Flea Markets. The other two will be on Sept. 29th, 1991 and Jan. 19th, 1992. Sellers can get ½ price by registering for all three events and paying the full amount in advance. Deadline dates are 5/3/91, 9/10/91, 1/8/92. Registered tables $15 for the first, $10 for each additional. Bring your own table at $1.80 per foot. $10 minimum. Tables $20 at the door, $2.50 per foot. Reserved tables and space will be held only to 9 AM. No refunds without notification of cancellation 72 hours in advance of each event. Admission $4, kids under 12 free. Set-up at 7 AM. To register, call *Otto Supliski WB2SLQ, (914) 969–1053.*

MAY 11

MANITOWOC, WI The Mancorad RC will hold its annual Hamfest from 8 AM–5 PM at the Manitowoc County Expo Ctr. Flea Market (amateur, computer, SWL). VE Exams. Advance tickets $2, $3 at the door. 8′ tables $3, with electric outlet $8. SASE to *Mancorad RC, PO Box 204, Manitowoc WI 54220.*

SPRINGDALE, AR The Northwest Arkansas ARC will hold "HAMFEST 91" at the Rodeo Grounds Community Building from 8 AM–4 PM. Free admission. Tables $5 each, advance registration required. Tailgating $4 per vehicle. Free parking. Talk-in on 146.76 (–.600). Contact *Jim Henington KB5ITL, PO Box 278, West Fork AR 72774. (501) 839–2488 after 4:30 PM. Via packet KB5ITL @ KA5BML.AR.USA.*

MAY 12

ATHENS, OH The Athens County ARA will hold its 12th annual Hamfest at the City Rec. Center from 8 AM–3 PM. Admission $4 per ham, spouses allowed in free. Free Tailgating space. Indoor space by advance registration only. For info write to *Carl J. Denbow KA8JXG, 63 Morris Ave., Athens OH 45701.* For registration contact *John Biddle WD8JLM, 80 Wonder Hills Dr., Athens OH 45701. (614 594–8901 after 6 PM.* Talk-in: 145.15/.55 MHz.

MAY 18

FORESTDALE, RI The Rhode Island Amateur FM Repeater Service, Inc. will hold their annual Spring Auction and Flea Market at the VFW Post 6342. The Flea Market starts at 8 AM, spaces are $5 each. The Auction will be from 11 AM–3 PM. Free admission. Talk-in on 146.76. Contact *Rick Fairweather K1KYI, PO Box 591, Harrisville RI 02830* or call *(401) 568–0566* between 7–8 PM.

EPHRATA, PA The Ephrata Area Repeater Society, Inc. will hold the Lancaster County Hamfest at the Ephrata Senior High School beginning at 8 AM. Set-up at 6:30 AM. Handicap accessible. Admission $4. Tailgating $3. Tables $6. Talk-in on 145.45, 146.52 and 444.65 MHz. For info/reservations contact *Tom Youngberg K3RZF, (215) 267–2514* after 6 PM, or write, *E.A.R.S., 906 Clearview Ave., Ephrata PA 17522.*

DEWITT, IA The Clinton ARC will hold "HAMFEST 91" at the 4-H County Fair Grounds starting at 8 AM. Set-up at 6 AM. Over-night security. Talk-in: 147.06 and 145.430. VE Exams start at 9 AM. ATV and DX packet cluster seminars. Contact *Darryl Petersen KD0PY, RR1 Box 84, Bryant IA 52727.*

CADILLAC, MI The Wexaukee ARA will sponsor their annual Swap and Shop at the Cadillac Middle School from 8 AM–1 PM. Admission $3., tables $6. Talk-in on 146.38/.98 repeater. Contact *Dan Schmidt KE8KU, (616) 775–0998,* or write, *Wexaukee ARA, PO Box 163, Cadillac MI 49601.*

MAY 19

WABASH, IN The Wabash County ARC will hold its 23rd annual Hamfest at the Wabash County 4-H Fairgrounds from 6 AM–4 PM. Free overnight camping. Advance tickets $4.50, $5 at the door. Amateur exams will be given for Tech–Extra by the North Central Indiana Examiner Team from 8 AM–Noon. Talk-in: 147.63/.03, 146.52/.52, 146.94/.94. For ticket info send SASE to *Don Spangler, 235 southwood Dr., Wabash IN 46992. (219) 563–5564.*

PEOTONE, IL The annual Hamfest sponsored by the Kankakee ARS will be held at the Will County Fairgrounds from 8 AM–2 PM. Set-up 6 AM–8 AM. Free parking. Overnight RV parking, no hookups. Advance tickets $3.50, $4 at the door. Talk-in on 146.34/.94. Contact *KARS, C/O Frank DalCanton KA9PWW, 117 Kristina Dr., Bourbonnais IL 60914. (815) 932–5950 after 7 PM CST.*

MAY 25

DURHAM, NC The Durham FM Assn. will hold its 18th annual "DUR-HAM-FEST" under the south parking deck of the South Square Mall shopping center. Wheelchair accessible. VE Exams contact: *Pete Goolsby KY4Y, 120 Radcliff Circle, Durham NC 27713, (919) 544–3215.* Advance tickets are $4, $5 at the door. Please SASE with your order to *R.P. Buehlmann N4IQA, 1314 Chaney Rd., Raleigh NC 27606. For table info and registration contact* Thomas D. Ferrell WA4MWT, 3012 Glendale Ave., Durham NC 27707, (919) 220–5018, *or* Sid Edwards W4QWM, 1700 High St., Durham NC 27707, (919) 489–2933. *To reserve space and advance tickets, contact Sid Edwards W4QWM, (919) 489–2933 before 9:15 PM.*

MAY 26

WEST FRIENDSHIP, MD The Maryland FM Assn. will sponsor its annual Memorial Day Hamfest (for amateur radio related items only), at the Howard County Fairgrounds from 8 AM–3 PM (premises must be cleared by 5 PM). Talk-in on 146.16/.76, 223.16/224.76 and 449.00/444.00 WA3DZD repeater. Donation $4, tailgating $3. Tables $15 in advance, $20 at the door (if available). Only PAID table reservations accepted. Make checks payable to MFMA, Inc., and SASE to *Melvin Seyle WA3KZR, 15809 Pointer Ridge Dr., Bowie MD 20716, (301) 249–6147.* Commercial vendors must have proper tax/license certificates available. All proceeds will be used to improve the Club's repeater system.

CHICAGO, IL Chicago ARC will hold the annual Hamfest at De Vry Inst. of Tech., from 8 AM–3 PM. Set-up at 6 AM. Tickets $3 in advance, $4 at the door. Write to *CARC, 5631 W. Irving Park Rd., Chicago IL 60634.* Or call *(312) 545–3622.* Talk-in 147.225 +600 PL.

SPECIAL EVENT STATIONS

MAY

VERMONT Throughout the year, Special Event Stations from Vermont will be operating 25 kHz up from the bottom of the Novice and General bands to help celebrate Vermont's 200th Anniversary. RTTY/AMTOR/etc. will be in the digital sub-bands. To obtain a special Certificate, send $1 and a SASE to *Amateur Radio Bicentennial Project, PO Box 200, Graniteville VT 05654.* Foreign stations, send only SAE and IRC's, to cover postage.

MAY 3–12

SACRAMENTO, CA The California State Railroad Museum will operate WB6RVR from the Central Pacific Depot in Old Sacramento, May 3rd–May 12th, 1600–2400Z during "RAILFAIR '91," to commemorate the Museum's 10th anniversary. Frequencies: Phone 7.270, 14.270, 21.370, and 28.370 MHz. For commemorative QSL, send your QSL and No. 10 SASE to *California State Railroad Museum, Attn: Steam Trains, 111 "I" St., Sacramento CA 95814.*

MAY 4

GRANTSBORO, NC The Ol' Country Fair of Pamlico Community College will operate N4WRR from 1400–1900Z to commemorate the 17th annual Fair. Operation will be 25 kHz up from the General band edges and the Novice 10 meter phone band. Send QSL, QSO number, and SASE to *N4WRR, PCC, PO Box 185, Grantsboro NC 28529-0185.*

MAY 4

BAYONNE, NJ The Bayonne Emergency Management ARC, sponsored by the City of Bayonne, NJ, will operate W2ODV from 1200 UTC–2400 UTC on May 4th and 1200 UTC–2400 UTC on May 5th. Operation will be on all bands from 80 meters through 440 MHz, with concentration in the Novice and General class portions. Each club member will sign their own call followed by "BEMARC Special Event Station." To receive a special Certificate, send a QSL card with an 9 X 12 SASE and one unit of postage (or one IRC) to *BEMARC, c/o John Anzivino, 236 Pearsall Ave., Jersey City NJ 07305.*

MAY 10

PROMONTORY, UT The Odgen ARC will operate W7STB from Promontory Summit, to commemorate the 122nd year of the driving of the Golden Spike, from 0001Z–2100Z. Frequency will be on one of the following: 3.970, 7.270, 14.280, 21.375 or 28.415 MHz. Send QSL and SASE to *Ogden ARC, PO Box 3353, Ogden UT 84409.*

MAY 11–12

LAS VEGAS, NV The Nevada QSO Party, sponsored by the Frontier ARS, will be held from 0000Z May 11th–0600Z May 12th. Frequencies: 6 through 160 meters. Modes: CW/SSB/RTTY/SSTV/Packet. Scoring: 1 point for Phone QSO; 2 points other modes. Nevada stations multipy by state/province/country total. Non-Nevada stations multiply by number of Nevada counties. Awards: Certificates to top score of each state/province/DXCC country. Mail entry by June 1st, 1991 to *Jim Frye NW7O, 4120 Oakhill Ave., Las Vegas NV 89121.*

MAY 11–19

HOLLAND, MI The Holland ARC will operate K8DAA to celebrate Tulip Time. Frequencies: Low end of General bands on 15 and 20 meters, and 28400 on 10 meters. For Certificate, just work two HARC members or the Club station. Send QSL card with calls worked and SASE (legal size or 9 X 12) to *Dave Lamer WA8RSA, 2866 E. Chester Dr., Zeeland MI 49464.*

MAY 12–17

DAVIS MTNS, TX Amateur astronomers/hams representing the Southwest Region of The Astronomical League, will operate K5GH at the 10th annual Texas Star Party, located near the University of Texas' McDonald Observatory in the Davis Mtns., from May 12th–17th. Frequencies: (±QRM): 28365, 21365, 14265 and 7265. SSTV and CW contacts on request. For an astronomical-theme QSL card, send QSL and SASE to *K5GH-TSP, 721 White Dr., Garland TX 75040.*

MAY 18

HANFORD, CA The Kings ARC will operate AA6GZ, 1600Z–2200Z, to commemorate the Centennial Anniversary of Hanford, CA. Frequencies: The General 10, 15 and 20 meter phone and the Novice portion of 10 meters. For a certificate, SASE to *KC6HVE, PO Box 548, Armona CA 93202.*

MAY 18–19

CHICAGO, IL The DuPage ARC will operate Club station W9DUP, to commemorate Armed Forces Day. Operation will be from the U-505 submarine at The Chicago Museum of Science and Industry, Sat. & Sun. from 1600 UTC–2300 UTC. Frequencies: 7.250, 14.290, 28.400 SSB and 145.25 (–.600). For a certificate, send QSL and SASE to *Jack Carr NV9S, DARC, PO Box 71, Clarendon Hills IL 60514.*

ST CHARLES, MO The St. Charles ARC will operate WB0HSI from 1300Z–2100Z as part of the Lewis and Clark Rendezvous. Frequencies: 7250, 14250, 21350, 28410, and 146.67, as conditions permit. For 8½ X 11 certificate, send a large SASE to the *St. Charles ARC, PO Box 1429, St. Charles MO 63302-1429.*

LONG BEACH, CA The Hollywood Chapter of the Lambda ARC will operate K7OO from the site of the annual cultural pride festival, adjacent to the Queen Mary in Long Beach. Frequencies: General portions of the 40, 20, and 15 meter bands and the Novice portion of the 10 meter band. For a special QSL, send a QSL card and business size SASE to *LARC, PO Box 91299, Long Beach CA 90809.*

MAY 28

ANNAPOLIS, MD The United States Naval Academy ARC will operate the Club station, W3ADO, from 1300Z–1800Z, to celebrate commissioning week at the Naval Academy. Operation will be in the lower 50 kHz of the General and Novice phone bands. For QSL, send QSL (no SASE) to *Peter Erpelding WB6MXL, 14D Sellers Rd., Annapolis MD 21402.*

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I need the manuals for the Yaesu FRG-7 receiver. I will pay copy and postage costs. *Tom Francis KB5OCU, RT 2 Box 336, Leonard TX 75452. (903) 568–4698.*

I need a schematic or other printed material on a Pace FM 152 VHF transceiver. It is presently tuned to 156 MHz and I would like to retune it to the 2 meter band. I will appreciate any help I can get on this project. Also, does anyone know the address of Pace Comm. Div., or PATHCOM, Inc.? Thanks. *B.T. Jeavons WA6GEF, 5825 Cedar Rd., Ocean Springs MS 39564.*

I need a schematic and/or manual for an EICO oscilloscope Model 470. Also, a bathtub cap for same: 2X.5 MFD 1500VDC. *William R. Bogart KA9CWK, RR2 Box 50B, Covington IN 47932.*

I am looking for the manufacturer of a beam antenna. It is wound on fiberglass rods and is wound with copper tape instead of loading coils. *Pete Anderson W5VYV, 1209 W. Cochiti, Hobbs NM 88240.*

Wanted: A Model J-37 CW aircraft key for display in a WW2 aircraft radio museum. A small sign indicating the name of the donor will be placed next to the key in the museum. *Bill Pearce W0MWO, Eagles Rest, 9 Knightsbridge Place, Pueblo CO 81001–1434. (719) 544–0691.*

I would like to exchange operating and maintenance ideas with anyone still operating Hallicrafter's HURRICANE transceivers. Please contact *R.P. Pauliukonis KB1TY, PO Box 321, Strafford NH 03884.*

Wanted: Teletype LPR35BWA w/LRB23 base, LMU4 motor and LBAC255BR cabinet. *Charles T. Huth, 229 Melmore St., Tiffin OH 44883. (419) 448–0007.*

The Dayton ARA is now accepting applications for the 1991 Scholarship Program. There will be eight $1500 scholarships available this year. The program is open to any FCC licensed amateur operator graduating from high school in 1991. There are no restrictions on class of license or planned course of study. For application forms and information, write to *DARA Scholarship Committee, 317 Ernst Ave., Dayton OH 45405.*

Teacher of developmentally-disadvantaged high school students would appreciate donation of books on audio and RF equipment construction and design, intended for home-brewers (no college engineering texts please). Cannot accept equipment, magazines, or books that are moldy. I will reimburse shipping at *cheapest* commercial rate (book rate, first class, or UPS). *Douglas Conley, c/o Conley Vision, 12008 W. 87 St. Pkwy., Lenexa KS 66215.*

Wanted: Operating manual (or photo copy) for the Hickok Model 752-A tube tester. I will pay all costs and postage. *Hal Smith W2GKE, 26 Linden St., Bayonne NJ 07002. (201) 436–1405.*

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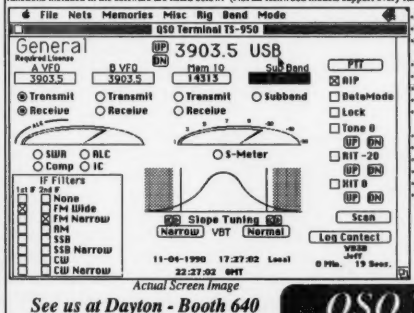

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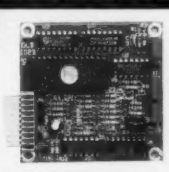

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CIRCLE 17 ON READER SERVICE CARD

73 INTERNATIONAL

Arnie Johnson N1BAC
103 Old Homestead Hwy.
N. Swanzey NH 03431

Notes from FN42

Good news as I am writing the column; the fighting in the Persian Gulf has ended. I have made an effort to not write about what has been happening, but I read in a recent Wall Street Journal *that there was ham activity from Kuwait during the conflict. It will be reported under the Kuwait banner in "Roundup."*

This month's column is colorful, with pictures from the Greek climbers shown in last month's issue, the QSL card from Olimpiada Cultural Barcelona '92, a photo of Byong-Joo Cho HL5AP and his family, and letters from Rod Hallen 5Z4BH and Woodson Gannaway N5KVB/EA.

And now, on with the show!

—Arnie N1BAC.

Photo B. QSL card for the Olimpiada Cultural Barcelona '92.

Photo A. Our Hambassador to South Korea, Byong-Joo Cho HL5AP, and his beautiful family.

ROUNDUP

Japan From *The JARL News*: "Radio Amateur Becomes Minister of Posts and Telecommunications," reads the headline. Mr. Katsutsugu Sekiya JA5FHB, a member of the House of Representatives, was welcomed and honored as the new minister by 200 JARL members. Mr. Shozo Hara JA1AN, President of JARL, expressed his congratuations and sincere expectations for Mr. Sekiya's good role for further promotion of amateur radio in Japan.

Mr. Sekiya acquired his first amateur radio license in 1970, and he is one of the founding members of Diet Ham Club, JG1ZQU, which consists of 21 members of the House of Representatives, 1 member of the House of Counselors, and 59 members of the Diet staff.

On another note, Ginowan City in Okinawa has been selected as the site for JARL's 33rd General Assembly, scheduled to be held on Sunday, May 26, 1991.

The Annual General Assembly is that time of the year when all participating members reflect upon JARL's activities and operations, and in so doing promote mutual understanding. It is also an important meeting where the pros and cons of yearly programs, as well as the all-important budget, will be discussed and resolved, hopefully to the eventual satisfaction of all members.

Photo C. SV2AHJ, of the Greek Mountaineers' Club, QSOing with the GCR250 HF rig. WOW! What a view!

Kuwait From *The Wall Street Journal,* March 4, 1991, dateline Kuwait City, Kuwait. This article describes how some of the Kuwaitis made it through the crisis by bartering food and material things.

One of the families mentioned was the "Sultans," a prominent merchant family. They asked that their real surname not be published because they fear for the lives of three family members still held by Iraq. Amiri, mentioned in the following paragraph, is a member of that family.

"In one way, the Sultans did continue to defy the occupation directly. Seated at the computer in his basement, one of Amiri's cousins, a ham radio operator, continues to this day to run one of the few communications links with the outside world. Mostly, he has sent out personal messages to Kuwaitis abroad. Several months into the occupation, the Iraqis compiled a list of hams and made a sweep of their equipment. Amiri's cousin politely greeted the soldiers at his door and handed them an antiquated piece of radio gear. Meanwhile, Amiri continued broadcasting from his basement. He also piled boxes of food at his door to distract future visitors on similar missions."

[Not every member of the "Sultan" family or other families were as lucky. Some were killed and some have been taken and not heard from since. Let us all pray that those missing will be returned safely, and that the crisis in the Middle East will be solved to the satisfaction of ALL.

—Arnie]

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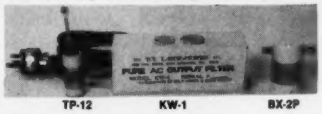

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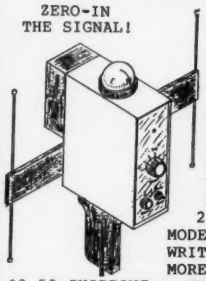

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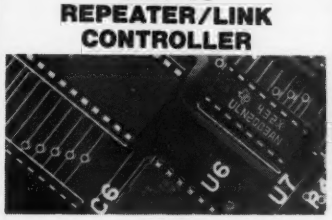

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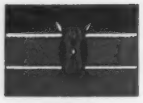

KENYA

Rod Hallen 5Z4BH
AMEMBASSY Box 55A
APO New York 09675

Since the 20th of September I have only spent two weeks in Kenya. The rest of that time I was in the U.S.A. or traveling in East Africa.

Just before I left Nairobi for the states, my landlord informed me that he was going to put a new roof on my house while I was gone. So, I had to take all of my antennas down, and I haven't been on the air since, except for the local 2 meter repeater. I have a week off so I hope to get at least my G5RV back up. Unfortunately, the new roof is peaked and made of aluminum, where the old one was flat concrete.

I'm due out of here *[Kenya]* one year from now, and have just sent in my bidlist. On that list is Cairo (SU), Karachi (AP), Bonn (DL), and Miami (W4?). I took a trip to Bahrain (A92) early in September, and stopped off in Cairo for a few days to look the place over. I liked what I saw, so put it at the top of my list. Pakistan is also a good assignment, except that they refuse to issue ham licenses to foreigners. However, I have a good friend, Ben 5Z4BG, who has already received that assignment, and he will do what he can to remedy the situation. We'll see.

I was looking at the list of Hambassadors, and I have been in about half of those countries, but I've only met one of the Hambassadors personally. *[Me, too! Hopefully there will be more.—Arnie]* While I was stationed in Manila from 1981 to 1985, I used to visit Hong Kong quite regularly. In fact, it is still my favorite place in the whole world. In any case, I got my VS6 license with the help of Hambassador Phil Scott VS6CT, and operated from his QTH on a number of occasions. That was before he moved to the fancy new QTH that I saw pictured in a recent issue.

I'll pass along some info on what is happening out here as soon as I get back into the swing of things. 73.

SPAIN

Woodson Gannaway N5KVB/EA
Apartado 11
35450 Santa Maria de Guia
(Las Palmas de G.C.)
Islas Canarias, Espana

Even though I still have the same restrictive antenna situation, I'm looking for more contacts with my friends in the Americas, both North and South. And to spread the word maybe my editor will let me run a column or two in Spanish to see what we can stir up. *[What do you readers think?—Arnie]* Sometimes we forget how much we lose by assuming that everyone speaks English. True, English is the official language of all hams, is universally used in the sciences, and was recently selected as the official language for the European Common Market, but it is not our job to rub people's noses in it! If you want to be a friend to someone, you can pay them no greater compliment than to learn their language, and work, really work, to understand their culture. It is an adventure.

Christmas Day I visited the Soviet training ship *Sedov*, a beautiful 4-master. Right, a sailing ship. I've got a soft spot in my heart for them, and I've waited for over two years for the chance to visit one. This time it finally worked out, and I spent a pleasant hour and a half with her.

I spent a few minutes with the radio officer, Igor, who spoke passable English. He showed me the radio room and the inside of one of their Russian-made transmitters. It was extremely well laid out and well made. Big and heavy, he said. On a ship that is no problem, I replied. He was extremely pleasant and I'm sure he spoke other languages, and once again, I was humbled by the thought of our unspoken attitude of superiority in assuming that the world should speak English, and we ourselves shouldn't exert ourselves in the least to learn other languages. Here I am with only two languages, trying to decide which will be the third.

The *Sedov* carries a crew of 195, of which 123 are cadets, and has an overall length of 117.5 meters. In 1982 she achieved a world speed record of 18.5 knots for her class. She was launched in 1921 as the *Magdalene Vinnen* under the German flag. In 1946 she was acquired by the USSR. She carries 17 sails; I almost got to see her set sail to depart, but had to go teach a class instead.

This year or next, I will be retiring my N5KVB/EA call for an EA8??? call for the rest of the time I live here in Spain. The residency papers are finally coming through, and that will be the practical effect in this area. Now I'll have to find other ways to effectively discourage people from using me just as a means to get a QSL card from EA8-land. Where there is a will, there is a way. I do run Morse in Spanish, and I might try that on them. I've taken Wayne's advice and developed a remarkable ability to not give signal reports even when asked over and over again. I guess it is a form of selective hearing; because if you ask or want to tell me about your hopes and dreams, what is new in your area (I asked a Czech ham that and he didn't let up for fifteen straight minutes!), or what you're excited about, they just don't make QRM that can keep me from hearing you. Unfortunately I do get wiped out by a lid once in a while, like anybody else.

A friend is checking out the situation of the 500th commemorative voyage of Columbus in 1992 as it relates to ham radio. Hopefully she will come up with something for us. Other than that, a Happy New Year *[A little late but well-meaning.]* to all of you, with strong wishes that whatever happens, it leads us closer to the world peace and unity that we all need and pray for. 73 once again, Woodson.

CIRCUITS

Number 31 on your Feedback card

Great Ideas From Our Readers

Field-Strength Meter/Carrier Alarm/Sidetone Monitor

A field-strength meter has many uses. Besides the normal functions of checking the field around an antenna and measuring the front-to-back ratio of a beam, it is also handy in the shack. A glance at the meter when you key your rig shows that the antenna is radiating power. It can also be used when adjusting the antenna tuner for maximum output at minimum SWR, or minimum plate current if you use an amplifier.

A few junk box parts added to a standard field-strength meter will produce a loud audible signal when your rig—or your neighbor's—is keyed. Thus, it can also serve as a sidetone monitor. Many hams have separate transmitters and receivers, and often operate each on a slightly different frequency, including split operation. Unless they have sidetone monitors, operation can be difficult. An audible monitor like the one described here is somewhat loud (a piece of tape over the alarm unit will help), but it will enable you to send accurate CW.

I originally designed and built this instrument because the ham downstairs—my son Kraig WB2PLW—operates 100 watts, and our outdoor antennas are mere feet apart. What I needed was a carrier-operated alarm to warn me to ground my antenna, to avoid high levels of RF being pumped into my transceivers, whenever he decided to go on the air.

Figure 1(a) shows the result. I had already built a field-strength meter, so I merely added the few parts necessary for the audible signal. If you're building this instrument from scratch, a simpler and cheaper version is shown in Figure 1(b).

In operation, the 2N3904 transistor is cut off in the absence of an RF signal, and no current is drawn from the 9-volt battery. When a strong RF carrier is present, it is rectified by the 1N34A diode which places a positive bias on the transistor base, turning it on. The piezoelectric alarm forming the collector load draws between 8 and 12 mA through the transistor, and emits a loud sound. There is no noticeable time delay in the circuit; it will follow even a very rapid keying. An SPST switch controls collector operating voltage, so you can turn the audible section off while operating, as desired.

Any small NPN transistor will work in this circuit, as will any RF diodes. The 1N914 in the emitter is there to assure that the transistor remains cut off unless a very strong carrier is detected. This is necessary in some cases, if you are relatively near the transmitter tower of a local radio broadcast station. The "antenna" for the device can be several feet of wire, the length depending upon the strength of the carrier of your own or any nearby ham transmitting antenna. I use about 8 feet of hookup wire as an antenna for the meter. My transmitter is a 20-watter, and my son's runs 100 watts. My dipole and his antenna array are about 30 feet from my operating position.

The piezo alarm element I used is available for $1 from Hosfelt Electronics, Inc., 2700 Sunset Blvd., Steubenville OH 43952 (Cat. No. LERT) and operates from 2 to 12 volts DC. Any similar device will work as well, and you may have one in your junk box. The transistor, diodes, RF choke (if used) and bypass capacitor are not critical, and are available from Radio Shack and most mail order dealers, if you don't already have them in your junk box.

J. Frank Brumbaugh KB4ZGC
Buffalo NY

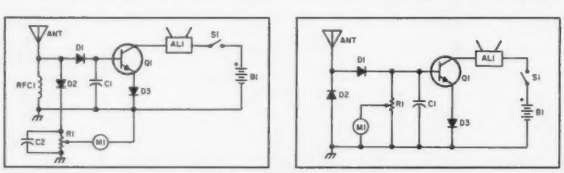

Figure 1. Schematics for the field-strength meter (a), and for the simpler version (b).

Parts List

C1, C2	0.01–0,25 µF disc, ceramic
D1, D2	1N34A, or equivalent
D3	1N914, 1N4148, or equivalent
M1	Surplus meter, 100 µA–1 mA
RFC1	1–2.5 mH
R1	5k or 10kΩ potentiometer
Q1	2N3904 (ECG123 equivalent)
AL1	Piezoelectric alarm unit
B1	9V battery

Covert Hamming *Continued from page 20*

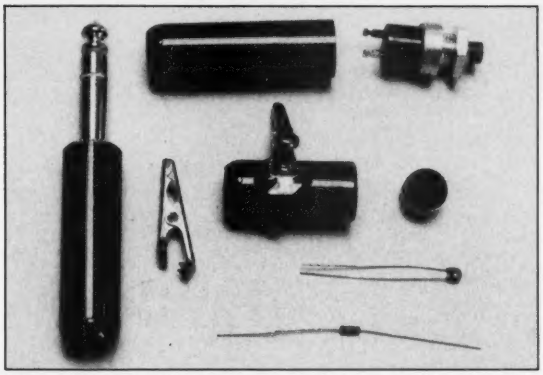

Photo C. Detail of the microphone and PTT assemblies. (Photo by Andy N6KAS.)

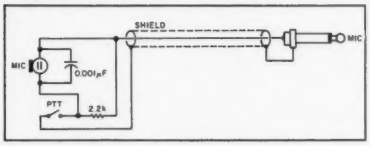

Figure 1. The original microphone wiring diagram.

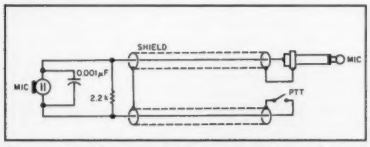

Figure 2. The modified covert wiring scheme.

three pins. Jumper the center pin to the pin which connects to the case, thereby creating a 2-pin element like the Radio Shack model.

After checkout, use a glob of silicon sealant where the wires enter the housings. This adds tensile strength.

You need some manual dexterity to solder the mike element. Be careful to avoid solder bridges and burned wires. Don't overheat the pins; there's an FET inside, and you could damage it!

Now that you've assembled your covert mike, just clip it onto your pocket or shirt collar and route the PTT switch down your sleeve or anywhere you can easily access it. Connect a small earphone to a mini-phono plug for receive and you're ready for some covert hamming (see Photos A and B).

The next time you're at a hamfest and you see someone talking to himself, it could be that he's been out in the sun too long . . . on the other hand, it could be that he's an Undercover Ham.

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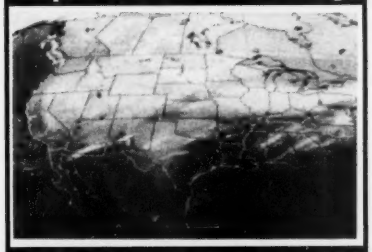

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One answer to the no-code brou-ha-ha is to make the code so simple to learn that it's a non-problem. Herewith the world's easiest code course—tens of thousands of hams have gotten their licenses this amazing new shortcut way. It's failure-proof. Most people are able to whip through the Novice test after spending less than three hours each on Genesis and The Stickler. People who have given up on other code courses find this one does the job in a jiffy. Going after your General? It's about time. Use the Back Breaker and you'll be there before you know it. A week should do it. Warning, 20wpm code almost invariably appears to cause irreparable, irreversible, permanent brain damage. Uncle Wayne accepts no responsibility whatever for anything that happens to those who are foolish enough to use the Courageous 20wpm tape.

73T05 **"Genesis"** **$5.95**

5 wpm—This is the beginning tape, taking you through the 26 letters, 10 numbers, and necessary punctuation, complete with practice every step of the way. The ease of learning gives confidence even to the faint of heart.

73T13 **"Back Breaker"** **$5.95**

13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language code at only 13 per. You'll need this extra margin to overcome the sheer panic universal in most test situations. You've come this far, so don't get code shy now!

73T06 **"The Stickler"** **$5.95**

6+ wpm—This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are sent at 13 wpm and spaced at 5 wpm. Code groups are entirely random characters sent in groups of five—definitely not memorizable!

73T20 **"Courageous"** **$5.95**

20+ wpm—Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the extra class license. We send the code faster than 20 per. It's like wearing lead weights on your feet when you run: You'll wonder why the examiner is sending so slowly!

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UW0591

RANDOM OUTPUT

David Cassidy N1GPH

Are You Having Enough Radio Fun?

A few months ago, Wayne came to me and said: "How about publishing a tabloid-type magazine, just for the newcomers to amateur radio? We could fill it with simple construction projects and easy theory articles so people could actually start to understand what they have memorized to pass the tests. We'd review every kit we could get our hands on, and we'd review all the latest gear from a Novice/Tech point of view. We could publish articles about how to get started in packet, ATV, moonbounce, microwaves, DXing, RTTY, satellites and all the other fun areas of ham radio. We could even reprint some of the great stuff from the 30-year history of *73*."

Well, of course I thought this was a great idea. You don't have to be a rocket scientist to understand most of the stuff we put into *73*, but we still get lots of letters asking for easier construction projects. Even some folks who have been hams for 20 years or more could benefit from a publication that's totally geared to the newcomer.

"What should we call it?" I asked.

"Hmmmm . . .," Wayne paused. "How about *Radio Fun*? It's short, would look good at the top of a masthead, and it describes the whole concept in two simple words."

"OK. Sounds great! How many new staff people do you think we should hire?" I asked.

"None."

"None?"

"None . . . at least for now. Let's just do it with the staff we have and see how it goes."

"OK," I said, though a bit less enthusiastically than before. It would be hectic, especially when both magazines came to deadline at about the same time, but the people who put together *73* every month are some of the best in the publishing business. They could handle it.

"So . . . I guess you want a business plan, advertising rates, a production schedule and all the rest." I started making a few notes on a legal pad. "When should we launch this? How about next fall?"

Wayne didn't miss a beat. "How about in 90 days . . . just in time for Dayton?"

You have to understand something about Wayne Green. He is not fond of being told why something can't be done. He is less fond of people who find problems without finding solutions. He also has very little patience with people who want to write reports, schedule meetings, "do" lunch or partake in all the other time-wasting activities that are a substitute for actually working in your average American business. I was trapped, and I knew it.

"We'll get right on it."

A New Ham Publication

For the past three months, the entire staff has been hard at work, making Wayne's idea of a newcomers' magazine a reality. Ads have been sold, columnists have been lined up, articles have been picked and edited, and the end result will . . . as Wayne "predicted" . . . be introduced at Dayton.

Radio Fun is for every ham, especially Novices and Techs, who wants to have more fun with amateur radio. We want to encourage everyone to upgrade, try a new mode or build a circuit. We want to give you the confidence to build a simple QRP rig and then go up on top of a mountain and have a ball with it. We want you to get involved with your local club, throw out all the old farts, and start promoting amateur radio as the fun hobby that it is.

Radio Fun will have monthly columns explaining radio theory. This is the stuff that most of us simply memorized in order to pass the test. Don't panic! This will be easy. If you follow the monthly column, you'll start to understand basic electronics and radio. Then we'll take you through the General class material, so your upgrade will be a snap. We've got Gordon West WB6NOA to write the monthly upgrade column. If you've ever been to one of Gordon's upgrade classes, or if you've even listened to his CW training tapes, you know that this is going to be fun.

Radio Fun wants you to have fun with whatever license you have. That's why we've got people like Carole Perry WB2MGP and Michael Geier KB1UM to write columns on all kinds of fun things to do. Bill Brown WB8ELK is going to help you get started in some of the less active modes like ATV, UHF/VHF DXing and microwaves. We want you to have fun with amateur radio, and we're going to show you how to do it.

You want simple construction articles? We got 'em! By the bushelbarrel-full! QRP rigs, antennas, test gear, station accessories . . . you name it, we got it. We'll make sure even a beginner can understand how to do it, and we'll always make sure that you can get the parts.

How about kits? We'll be reviewing every kit we can. We'll actually build them and report to you on how the kit rates. Are the instructions clear? Are all the parts included? Does the project work as advertised? Was the company available to help with any questions? This is the stuff you need to know BEFORE you buy a kit . . . and we'll tell you.

All product reviews in *Radio Fun* will be from a newcomer's point of view. We're even going to go back and reprint some reviews from the last 30 years of *73*. Since so many newcomers buy their first rig at a flea market, we figured it would make sense to publish reviews of this older gear.

The special premier issue of *Radio Fun* should be at your local ham store in a few weeks. It's a big, tabloid-sized newspaper, so you can't miss it. We'll also be sending them to as many hamfests and flea markets as we can. If you're a recent Novice or Technician, you just might get a free copy in the mail.

If you want to guarantee your copy of the premier issue, you have to subscribe BEFORE it is released. We're only printing a limited number, and when they're sold out . . . that's it. Check out the subscription ad in this issue of *73*. The charter subscription rate is only $9.97 for 12 issues. To sweeten the deal, we're collecting savings coupons from several advertisers. Everyone who subscribes at this pre-publication rate will receive at least $25 worth of coupons for all kinds of great products, including "buck-off" coupons for Uncle Wayne's Bookshelf. So you really can't lose.

Everyone at *73* is very excited about this new project, and we've received support from the biggest and best companies in the amateur radio industry. Now, all we need are readers. I hope you'll be one of them. After all . . . couldn't we all use a little more fun? 73

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

A Mixed Bag

May is one of those months that lies between the excellent propagation of the spring equinox and the poorer HF DX of the summer solstice, and therefore exhibits both good and poor DX conditions. Usually, the better conditions exist closer to the first of the month, and the poorer conditions toward the end . . . but "usual" doesn't always mean this month and this year!

For example, just a few months ago, most propagation analysts were surprised by the "plateau" in sunspot numbers accompanied by a reduction of solar flux that lasted nearly six months. No one could safely predict what would happen . . . and Old Sol fooled us again, as just two weeks ago, he showed a solar flux well over 300, one of the highest in this cycle. Does this mean, then, that we may have a double peak, or what? No one knows. Theoretically, we should be starting on the down side of Cycle 22. And perhaps we are; but Old Sol may have a few surprises in store yet.

Specifically, for May, you can expect a possible few "Poor" (see the calendar) propagation days centered around the 7th or 8th, and again around the 16th. The last week or so is expected to be only "Fair" to "Poor." The "Good" days are anticipated between the 1st and the 5th, the 10th to 14th, and the 19th to the 22nd of May.

Keep your ears and receivers tuned to WWV for late predictions and recent changes in the flux levels so that you can take advantage of conditions as they occur. The 18-minute, after-the-hour broadcasts at 5, 10, or 15 MHz are the ones I use; most frequently, the one on 10 MHz. Remember that you want a LOW "A" index (below 10), and a high solar flux index (above 180). This is not to say that higher magnetic field indexes and lower solar flux numbers render the bands unusable; it just means that they won't be as good for DX propagation. See you next month! 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	10/15
ARGENTINA	15	15/20	20	40	40	—	—	10	—	—	10/15	10/15
AUSTRALIA	10/15	20	20	20	20	40	20/40	20	—	—	—	10/15
CANAL ZONE	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
ENGLAND	20	40	40/80	80/160	40	—	—	15	10	15	15	20
HAWAII	10/15	15	20	20	20/40	20/40	20	20	—	—	—	10/15
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	10/15
MEXICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20	10/15	10	—	—	15
PUERTO RICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
SOUTH AFRICA	20/40	40	20	20	—	—	—	—	10	10	15	15
U.S.S.R.	40	80/160	20	20	—	—	—	10/15	10/15	—	20	20
WEST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

CENTRAL UNITED STATES TO:

ALASKA	10/15	15	20	20	20	—	20	20	—	—	—	10/15
ARGENTINA	15	15	20/40	40/80	20	—	—	10	—	—	10	10/15
AUSTRALIA	10/15	15	15	—	20	20/40	40	20	—	—	15	10
CANAL ZONE	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
ENGLAND	40	40/80	40/80	—	—	—	—	—	15	15	20	20
HAWAII	15	15	15	20	20	20/40	40	20	—	—	10	10
INDIA	15	15/20	—	—	—	—	—	10/20	15	—	—	—
JAPAN	10/15	15	20	20	20	—	20	20	—	—	—	10/15
MEXICO	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
PHILIPPINES	10/15	—	20	20	—	—	—	—	10/15	10/15	—	—
PUERTO RICO	15/20	15/20	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	10/20	20
U.S.S.R.	—	—	—	—	—	—	—	15	15	15	20	20

WESTERN UNITED STATES TO:

ALASKA	10/15	10/15	15	20	20	20	—	20	20	—	—	15
ARGENTINA	10/15	15	15	20	20	—	—	—	—	—	10	10
AUSTRALIA	10	10/15	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	15/40	20/40	20/40	(2)	—	—	10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	15	15	10/20	20
HAWAII	10/15	10/15	15	15/20	20/40	20/40	40	—	15	10	—	—
INDIA	—	15	20	—	—	—	—	—	10/20	15	—	—
JAPAN	10/15	10/15	15	20	20	20	—	—	20	—	—	15
MEXICO	10	15	15/40	20/40	20/40	(2)	—	—	10	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	20	15	15/20	—	—
PUERTO RICO	10	15	15/40	20/40	20/40	(2)	—	—	10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	15
U.S.S.R.	20	—	—	—	20	—	—	20	20	20	20	20
EAST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

* Try next higher band on "G" days. (1) Possible opening on this band on "G" days. (2) Try 80m.
Note A: Use values of 10/15 for 12m, 20 for 17m, 40 for 30m. Note B: This chart refers to the highest band possible at the time indicated. If no luck, try next lower band.

MAY 1991

SUN	MON	TUE	WED	THU	FRI	SAT
			1 G	2 G	3 G	4 G–F
5 F–P	6 P	7 P	8 P	9 P–F	10 F–G	11 F–G
12 F–G	13 G–F	14 F–P	15 P	16 P	17 P	18 P–F
19 F–G	20 G	21 G	22 G–F	23 F	24 F	25 F–P
26 F–P	27 P	28 P–F	29 P–F	30 P–F	31 P–F	

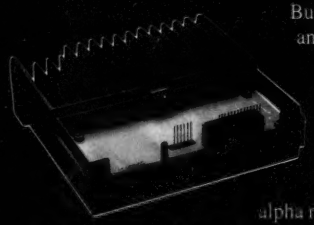
New from Yaesu

Tested Tough...

to Military Specs.

Yaesu Announces: One Year Limited Warranty on all Amateur Radio Products

We're not kidding. Superior engineering and durable construction comes standard on the FT-2400 and all Yaesu transceivers. That's why Yaesu is the official radio for the Nissan off-road race team. The FT-2400 is also the first radio ever to be submitted for the grueling MIL STD 810D rating.*



Built to take the abuse of highway and off-road use, the FT-2400 is packed with exceptional features including 26 full-function memory channels. The FT-2400 also allows you to identify channels with your choice of frequencies or alpha numeric readout. A new DTMF microphone with easy to see backlit keypad and a modular plug is included. And for effortless reading day or night a huge LCD display features big numbers and an automatic level dimmer control.

What's more, the engineers at Yaesu have added a practical feature, once you have programmed the FT-2400 just flip up the panel to keep those seldom used buttons out of the way, no more having to reset your mobile or accidentally pushing the wrong button.

Features:

• VHF Hi-power mobile three selectable power levels 50w high, 25w mid, 5w low • Wide band receiver coverage 140–174 Rx, 140–150 Tx • CTCSS encode built-in selectable from front panel • 5 scanning functions: Band scan, Memory scan, Memory channel lock-out with selectable scan stops and priority scan • Channel steps: 5, 10, 12.5, 15, 20, 25 and 50 • One piece die-cast flame construction body and heat sink • Automatic repeater offset • Programmable call channel

Options:

• DTMF calling and pager option (requires FRC-6 paging unit) • CTCSS decode unit (FTS-17A) • External speaker (SP-7) • Heavy duty microphone (MH-25A8J) • Power supply (FP-700)

If you need a mobile that's ready for anything, you can't beat the FT-2400. Contact your nearest Yaesu dealer.

YAESU

Performance without compromise.

*Approval Pending

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Specifications subject to change without notice.
Specifications guaranteed only within amateur bands.

KENWOOD

Our new TS-850S just made the competition obsolete

No competition class transceiver is even in the same ballpark as the TS-850S.

You'll find a superior intermodulation dynamic range of 108 dB throughout the entire 100 kHz to 30 MHz range.

Kenwood's optional DSP-100 Digital Signal Processor (DSP) converts audio signals to digital information, where it is shaped and processed by a microprocessor. For SSB work, this means a cleaner signal, and for CW, it allows adjustment of the rise and fall times for optimum waveshape. The DSP-100 also works at the receiver detector level for audio shaping, in all modes.

Other advanced technology in the TS-850S includes 10 Hz step dual VFOs, multi-mode scanning, full and semi break-in CW, superior interference reduction, keyer, dual noise blanker, and RIT/XIT. 100 memory channels store, transmit, and receive frequencies independently. High boost for SSB signal "punch". Microphone supplied.

The Kenwood TS-850S. All band. All mode. One year warranty. In a class by itself!

Key options.
DSP-100 Digital Signal Processor.
AT-300 160 - 10 m external antenna tuner.
AT-850 160 - 10 m internal antenna tuner.
DRU-2 Internal digital recording unit.
IF-232C Computer interface. **PG-2X** DC cable. **PS-52** Power supply. **SO-2** TCXO. **SP-31** Matching external speaker.
VS-2 Voice synthesizer. **YG-455C-1** 500 Hz CW filter for 455 kHz IF. **YG-455CN-1** 250 Hz CW filter for 455 kHz IF. **YK-88C-1** 500 Hz CW filter for 8.83 MHz IF. **YK-88CN-1** 270 Hz CW filter for 8.83 MHz IF. **YK-88SN-1** 1.8 kHz SSB filter for 8.83 MHz IF.

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